

Open Portfolios

MAKER EDUCATION INITIATIVE

DIY Documentation Tools for Makers

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Key to documenting a maker's work and creating portfolios is the need for tools to document making over time. While there are a few options that are commercially available, makers are creating their own tools and systems to integrate the physical and digital world. We are finding that these types of DIY documentation tools are critical for makers to capture, share, and reflect on their work.

UNIQUE CHALLENGES OF MAKER DOCUMENTATION

Making is often a highly mobile activity. While in some spaces makers occupy temporary workstations dedicated to projects-in-progress (see Research Brief "Maker Portfolios in Informal Education"), most makerspaces allocate areas for specific activities, such as stations for soldering, 3D printing, and woodworking, among others. In these cases, the creation of a project is frequently distributed across a diverse range of workstations that are loosely tied together by the maker's practice. This mobility needed in making challenges the idea of a fixed documentation space and recording documentation of the entire process.

In addition to being highly mobile, making typically occurs over a long period of time and requires sustained focus and concentration. In the flow of making, makers often want to keep doing what they set out to do, rather than pause for documentation. This places a core tension between balancing automated documentation (which generates large amounts of data) with manual forms of documentation (which can interrupt the maker's flow), and is connected to particular hardware and software challenges.

Software and hardware designed to capture making needs to build on the mobility of making, give room for

sustained concentration, and strike a balance between collecting too much data versus not enough. As makers float between workstations, transportable and lightweight ways to capture still and moving images of the making process are needed. Integrating documentation into the making process, as well as making it conveniently accessible, can support the concentrated flow of making. While obvious design ideas may involve automated documentation and capturing the entire process of making, an ideal documentation tool limits the editing of documentation as well. It captures the essential steps of the make—nothing less, nothing more. Tools that provide makers with control over capturing, while being mindful of disconnects, are the basis for creating of open portfolios for making.

CAPTURING WITH PHONES AND TABLETS

Today's tablets and smartphones are equipped with high-quality cameras and easy-to-use applications for capturing and editing photos and videos. Thus, it comes as no surprise that these are the most commonly turned-to tool for documenting work in makerspaces. Whether they are provided by the makerspace or the makers' personal devices, these tablets and smartphones act like buddies on the side, positioned on the table next to the maker or tucked into back pockets.

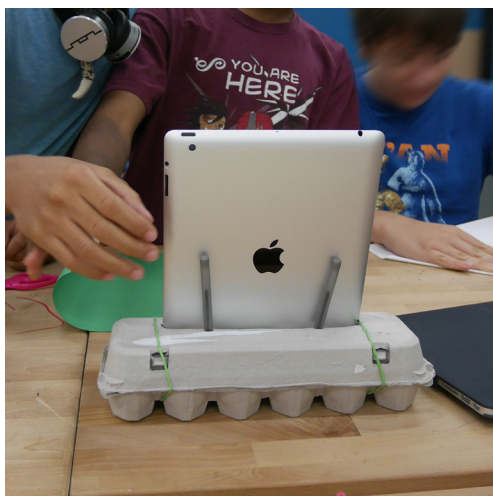
The problem with using such ubiquitous devices for documentation is that their presence is frequently taken for granted. Conceiving of the smartphone and tablets as they would for any other activity, makers might take photographs and videos of their work early on, and, as the making continues, forget about the presence of the tool. Out of the maker's sight and mind, someone else might step up and borrow the device not knowing that it is in use. Furthermore, when makers do remember to pick up

their phone or tablet to snap pictures, these pictures are oftentimes taken quickly and are blurred, making it difficult to recognize technical or decorative details.

Furthermore, using the cameras on most phones and tablets requires a custom mounting device to stay in position (in addition to other inconveniences such as frequently going to sleep). While such mounting devices are on the market, they can be costly and difficult to remember to bring along to the make. However, the broader maker and DIY (Do-It-Yourself) community offers creative and adaptable ways of stably mounting personal tablet computers and smartphones devices, reappropriating everyday materials for simple assembly. We share some of those solutions here in this brief. These smartphone and tablet mounts furnish the capturing of making, and we refer to them as “DIY documentation stations.”

DIY SOLUTIONS FOR MAKER DOCUMENTATION

In this research brief, we have sought out a range of potential tools for creating maker portfolios and offer a survey of inspirational instructions of DIY documentation stations using everyday materials. These tools extend the capacities of smartphones and tablets for capturing making, putting makers in the mindset to document their work by closely integrating these tools into the environment and workflow. For example, a screen can be stably positioned using everyday materials without assembling an elaborate documentation station. Using the screen as a mirror, an always-on camera can record much of the process or only key parts of making at the click of a button. Some of our favorite DIY documentation solutions are highlighted here.



Quick to assemble, lightweight and easily transportable, [THE EGG CARTON TABLET STAND](#) (Piikeastreet, 2012) transforms a typical egg carton into a stable, upright cradle for a tablet. A rectangular slit that is the width of the horizontal or vertical edge of a tablet is cut into the lid of the carton. Small weights inside the carton stabilize the station, and two pencils poked through the egg carton lid prevent the tablet from tipping over when placed into the rectangular perforation.

The egg carton tablet stand affords unobstructed access to the front and back cameras of most tablets. Young makers can take pictures of themselves with their work (“product selfies”) using the front camera of the tablet, communicating to the world that “it’s my project ... someone else did not make this.” Without repositioning the stand, makers can then use the rear camera to easily snap a picture or video of their project in isolation. The stationary design helps to avoid motion blur of handheld tablet photography, though young makers will often take advantage of its mobility by sliding the tablet stand across a workstation to snap picture series of other makers working at the table.

The documentation station can also support keeping documentation in mind by integrating a tablet into the environment and flow of making. Situating the stand behind the project and using the front-facing camera as a mirror, makers can gain a secondary perspective on their project as they work. This helps young makers not only refine their process, but also keeps the documentation vantagepoint salient in their mind as they work (thus helping to minimize the likelihood that they would forget about the tablet partway through their project). With the record stop/start button within close reach, makers can integrate documentation fluidly into their workflow and avoid the overly large data files that come from letting the camera run continuously.

A design drawback of the egg carton documentation station is its inflexibility—once assembled, the stand only fits one particular device and has a fixed angle. This limits makers’ capacity to capture making happening above or below the fixed angle of the camera position. Furthermore, young makers occasionally employ another person to take their portrait pictures or videos, as makers with project-filled hands cannot click the capture button or may wish to avoid covering the screen for the initial sec-

¹ While we found numerous examples of 3D-printed tripod mounts paired with downloadable models, we took particular notice of those DIY documentation stations for tablets and smartphones that do not require access to high-tech equipment since such high-tech tools may not be found at all sites and/or would take some time or specialized skills to produce.

ends of a video. This means that the flow of making for others may be interrupted.



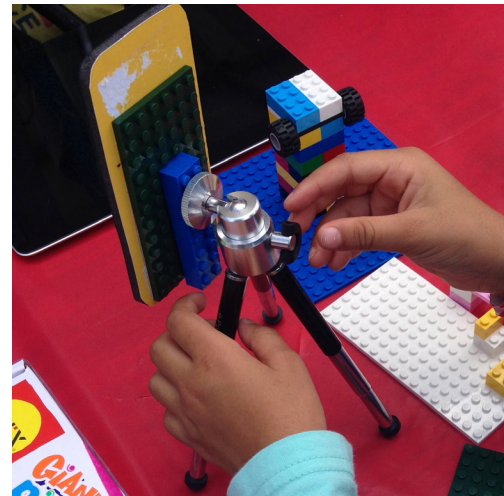
Designed to capture a bird's eye view of projects-in-progress, [THE POSTER BOARD SMARTPHONE STAND](#) (Re, 2013) balances a smartphone on an elevated arm above a uni-colored base. The shape of the arm, cut out of a poster board, is folded to create a platform at the center of the arm for the smartphone to be placed onto. Wedges cut out of the cardboard facilitate the folding of the thick material. Two perforations matching the width of the arm are made into the base of the documentation station for mounting the folded arm. For additional stability, the arm can be taped to the base and a smartphone case can be attached to the platform atop the arm.

The poster board smartphone stand is mobile, lightweight, and relatively quick to assemble. Makers can customize their camera angle by raising and stabilizing the phone using cardboard and tape, though once the stand is assembled, most makers treat the camera height as fixed.

Given the consistent camera angle and capacity for creating uni-colored backgrounds, the stand is ideal for capturing stop-motion animations and documenting the step-by-step evolution of a product (as animated GIFs or stepwise procedures). By setting their projects on the base of the documentation station, makers simply remove their hands from the camera's view to click a picture before resuming their work. This documentation station gives makers easy access to capturing with minimal interruption to the flow of making.

Using the base of the station as a workspace also offers makers control over what to capture: the recording can

be always on or can only capture parts of the process. However, the height of the poster-board arm presents affordances and challenges for the maker. For low-height arms, makers can view their project through the screen of their phone though this obscures a direct view of their hands. Conversely, a high arm lifts the camera above a natural viewing angle for the maker, recording a large view but making the process of checking the shot and capturing footage more laborious.



[THE SMARTPHONE LEGO BACK COVER](#) (Recyclelovers, 2014) is a simple, yet versatile documentation station. A flat Lego piece is taped to a smartphone, smartphone cover, or a tablet. By attaching another Lego piece to a flat surface, the smartphone with the Lego back cover can easily be fastened to any place, including a flat wall, the ceiling, the edge of a table or even a bicycle. This DIY documentation station is easily and quickly constructed and offers a range of creative means for capturing making. A buddy that can be picked up and become part of the action, the smartphone Lego back cover can be an interesting tool for capturing making in planned and creative ways, such as capturing video footage from a bicycle, the ceiling (for wide-angle videos of a group of makers at work), or even the neck of a guitar (Digital Harbor Foundation, 2014).

The highly mobile potential of this design is also its drawback. Similar to using a smartphone without any form of docking station, pictures without stabilization can turn out blurry, and it can be difficult to remember to pick up the smartphone from the table. This means that documentation with this station may need to be planned before making, rather than spontaneously snapping photos in the moment. Furthermore, the DIY documentation station does not necessarily succeed as a tool for

integrating documentation with the flow of making nor does it address the challenge of collecting too much data or too little data.



For a more playful perspective, [THE DINOSAUR SMARTPHONE STAND](#) (Venanzio, 2013) is a fun way of repurposing plastic action, animal, or dinosaur figures in service of documentation and portfolio creation. Any plastic toy cast of two pieces can be separated. By adding glue to one half of the toy and sticking a suction cup to the piece, the toy can attach to the back of a smartphone to create a personified, attention-grabbing documentation tool.

The dinosaur smartphone stand is mobile and can be transported to any workstation. Due to its playful appearance, many young makers gravitate instantly to these figures, augmenting documentation with storytelling. They pick up the action figures and begin to narrate their own stories and voices. Uniquely, this DIY documentation station shifts the focus from the documentation of one's own making to the documentation of the making of others. While this potentially interrupts the flow of making for others, it also presents an opportunity for a reporter-type maker who inquires about the work of others. The documentation of another person's work means also that control of what is being documented is shared between two people: the interviewer, who decides what to inquire about, and the interviewee, who decides what to reveal. In the conversation, which is suggested by the dinosaur smartphone stand, a form of collaborative making may emerge.

DISCUSSION AND FUTURE STEPS

These four are but a small selection of numerous DIY

documentation stations that offer mobility and stability for capturing making project in-action. Examples of other documentation stations focus on portable photography kits for taking professional-looking photographs, as well as 3D-printed tripod mounts for stabilizing smartphone and tablet cameras.

Documentation allows makers to stage themselves in relation to their projects, choosing to be in the picture and a part of the story or letting the product speak for itself. In selecting which tool or combination of tools to use, makers may also need to choose when to document, taking into consideration how much they desire to curate their work and identity. Continuous documentation of the making process may mean that makers are not interrupted in their flow of making. However, as makers may move from one location to another throughout their process, they must remember to move their documentation tools and stations with them. If makers collect a large amount of data, they must also consider the time needed to sift through that information, choose representative photographs, videos, or words, and reframe their experiences. Without simple ways of editing, the number of photographs and length of video recordings might make it challenging for makers to compile and share compelling media. Long videos are difficult for the larger community of makers to parse through and draw meaning from. In contrast, more selective documentation of their processes forces makers to be more conscientious with their planning and consistent with their documentation practices. They may have less data to draw from, but the curation process will likely be shorter and simpler. With either approach, makers are refining their own best practices for telling their story and offering insights to the wider community.

At the intersection of the planning of portfolio creation, processes of documentation, and intentional curation of collected content are the tools that afford documentation. Through our research and site visits, it has become apparent that many tools used to create portfolios in makerspaces are not specifically intended to document making or the processes of learning through making. With the recurring need to balance manual and automated ways of capturing, software and hardware tools need to solve open questions and be customizable for different activities and different audiences. They can help identify simpler production workflows that support the capture of digital and physical artifacts, collaboration across platforms and between multiple users or groups, and the sharing of resources across diverse online channels.

DIY documentation stations were important starting points to explore new ways to address some of these challenges. In addition, current software developments in the field were brought to the forefront in our conversations and site visits. Two notable ones are:

TACKK (tackk.com), an online tool and mobile application for easy authoring, editing, and designing of web pages. Interesting features include drag-and-drop arrangement of layout items, simple media embedding capabilities, and automatic saving of progress.

BUILD-IN-PROGRESS (buildinprogress.media.mit.edu), an online tool specifically designed for makers to document and visualize their process through a progressively growing tree structure representation. Designed by Tiffany Tseng of the MIT Media Lab, the tool is focused on documenting individual projects created by one or many makers.

In future work, we recommend investigating the design of time-lapse tools for photography and videography to reduce post-production needs, supporting the mirroring effect for reflective process of making, exploring attribution of co-created projects, and advancing ways for layers of identities to be revealed, including how portfolios may serve to develop and share identities related to groups or spaces.

In addition, openly networked design activities may contribute to our understanding of how tools and practices better connect. These could include convenings of

researchers and practitioners, who share their learning and processes at different stages of their own portfolio design and development, linking together ideas among the maker education network.

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