WorkMeowt: Fitness Tracking and Remote Play for Cats

By Alma Emadi and Joe Kohlmann

Domain Research

Pet Obesity in U.S. Households

Pet obesity is a serious problem in the modern household. According to CNN, "fifty-three percent of adult dogs and 55% of cats were classified as overweight or obese by their veterinarians"[1]. There is no mystery to its reason: it is due to too much food and not enough exercise. Pet obesity can lead to health issues, extra costs to the owners, and early deaths of beloved pets. These problems affect a huge portion of the population, as "thirty-nine percent of U.S. households own at least one dog, and 33% of households own at least one cat".

When it comes to solutions to this problem, few products exist, especially those employing technology for behavior change. In deciding the direction of this project, we looked at many different "smart" pet toys and nutrition systems and realized that none of them were really all that smart. Some gadgets, such as the FroliCat DART cat toy (pictured right), at least provide some level of interactivity, but can be quickly outsmarted by the pets. Hence, the lack of suitable products and pet obesity statistics proved to us that there is room for a design intervention that can improve the livelihood of these pets.

After defining or project concept, we did find that a dog activity monitor named Whistle. Its presence further indicates the existence of a potential market for pet activity monitoring solutions, as we did not find any cat-specific solutions similar to it.

Expert Interviews and Task Analysis

To decide what to prototype, we decided to talk to some domain experts. We interviewed the staff at the PAWS Cat Shelter in Roosevelt, WA to understand cat activities and how owners engage with them. It appeared that obesity in cats was linked to not getting enough exercise or playtime during the day, matching our prior research and experience. This could be because the cats' owners were busy or lacked the time to play with them. Furthermore, the owners had no idea what the cats were doing during the day while they were away from home. We saw this lack of information as an opportunity to leverage technology to enable these owners to gain insight into their cats' daily activities, as well as engage their pets remotely.

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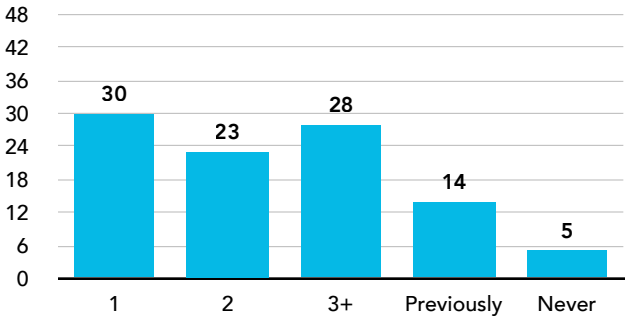
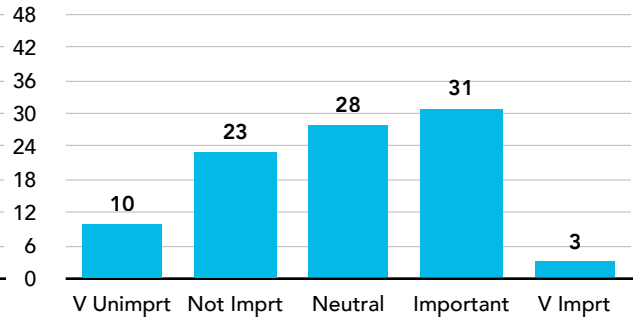
[1]J. Levs, "Obesity epidemic strikes U.S. pets," CNN, 04-Feb-2012. [Online]. Available: http://us.cnn.com/2012/02/03/living/overweight-pets/index.html. [Accessed: 15-Feb-2014].

Surveying Existing Pet Owners

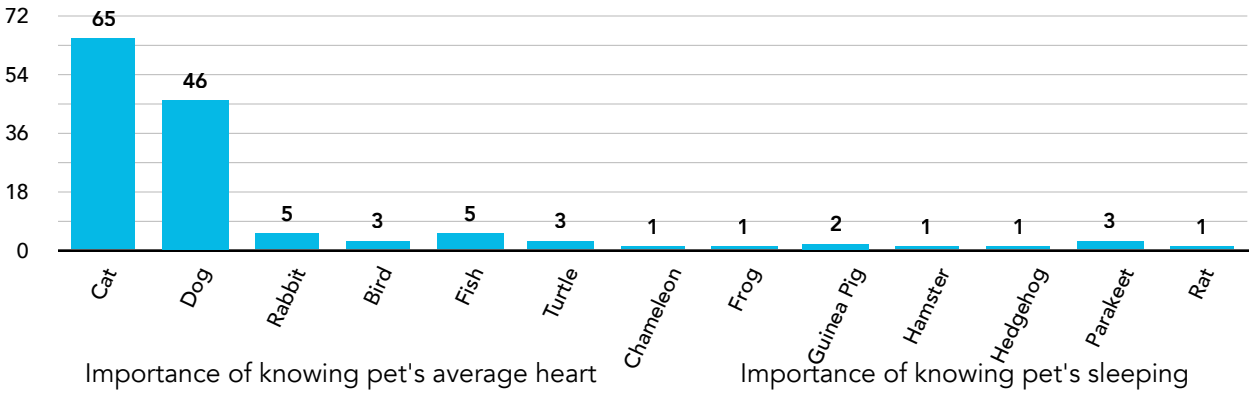
Do you own any pets?



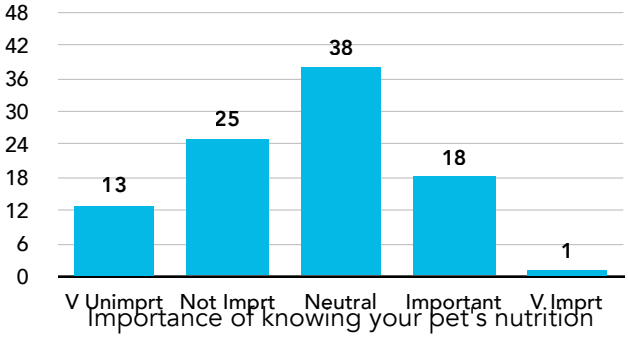
Importance of pet's activity level (steps per day)?



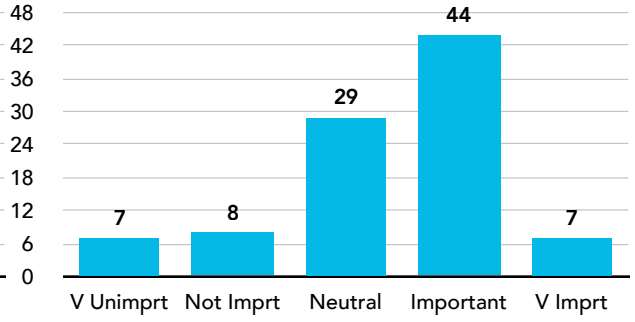
What kind of pet(s) do you have?



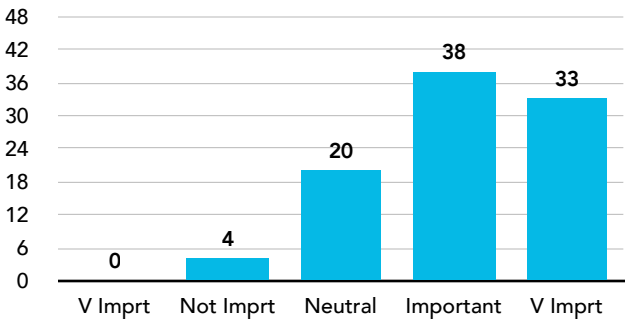
Importance of knowing pet's average heart rate?



Importance of knowing pet's sleeping patterns?



Importance of knowing your pet's nutrition information?

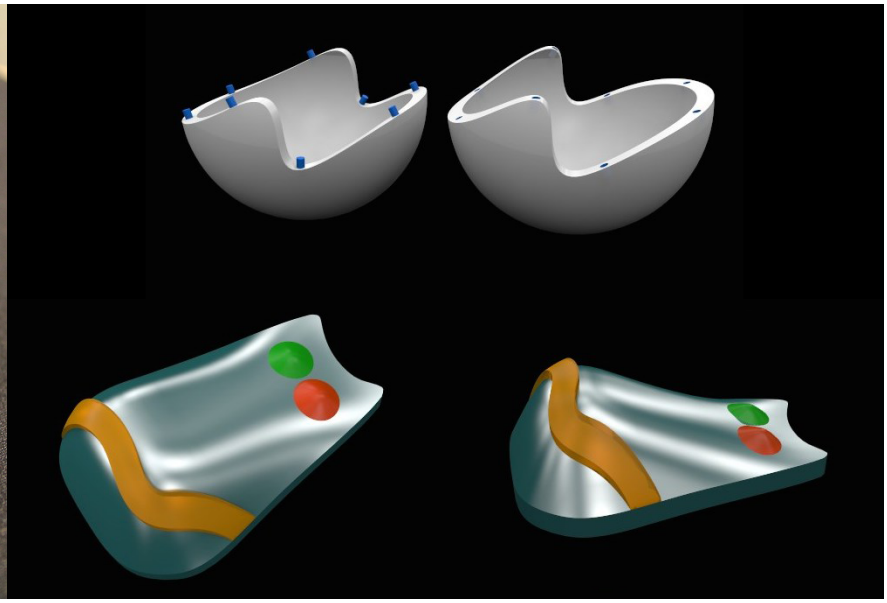


To further determine the info that owners would like to know about their pets, we surveyed 100 pet owners using Catalyst WebQ. The following figures and comments summarize our findings.

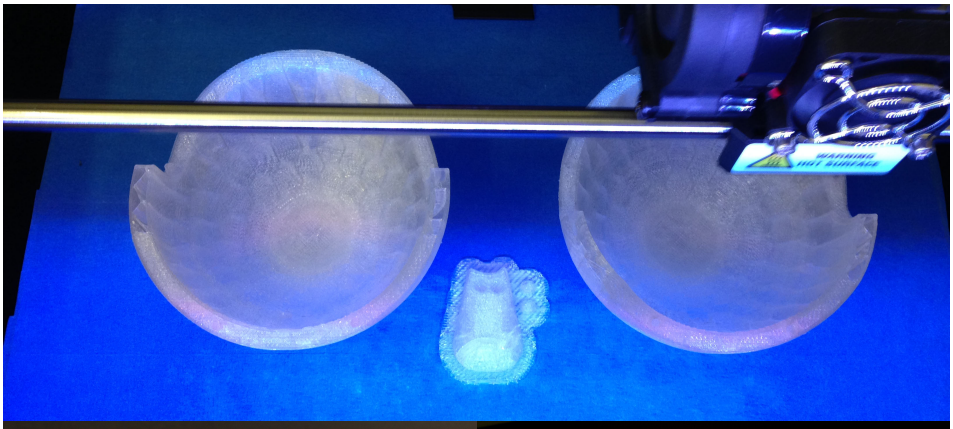
Is there any thing else you'd like to know about your pet or you'd like to tell us about?

- This would have been a lifesaver if our cat had had this when we accidentally locked him inside when on a 2 week holiday. He was supposed to eat and play outside all that time, but there he was inside, drinking from the toilet bowl, and another cat was eating his food so our neighbour didn't realise. Cat was remarkably fine when we arrived home, he'd lost that extra weight he needed to. But if we'd been able to monitor his food intake while we were away that would have been reassuring, and we would have been able to take action and get a friend to let him out!
- His name is Snoop Dragon and he burns trees everyday.
- I'd like to know where they go in the house and what they do when I'm not home
- When it needs to go "out"
- Honestly, no. I live in a quiet area, and my cats come and go as they please. As for my rabbits, I know all the important stuff- like their eating/sleeping patterns, through experience, as every rabbit is slightly different. I've never needed to make notes or ask someone, I just get to know it.
- no
- There emotions
- It would be nice to know the signs of anxiety in a dog because I had to leave my dog alone at home while I was at work.
- MY CATS WERE AWESOME
- when they are misbehaving when no one is home
- I would be curious to know more about why she is engaging in those actions, but realize that would require more instrumentation. Also, are you familiar with the cat project from the University of Georgia? This is awesome related work: http://www.kittycams.uga.edu/
- stress levels
- The amount of water that my pet drinks
- poo/pee occurrence or cycle
- my cat, Nigel, is more than 10 years old so I'd most like to know about patterns that are out of the ordinary that might signal something is wrong (I lost my second cat in January who seemed to suddenly get sick but there may have been warnings earlier that I did not detect.)
- Location, are there in the house or did they sneak out?
- Easier way to track weight and calorie info
- I would only need to know HR if my pet had a heart condition. Same with food intake if my pet was obese. Tracking general overall activity would be good, an active cat during the day means I get to sleep at night. Location (of an outdoor pet) woudl be good, cats can roam up to a 1 mile from the house.
- It would be interesting to know about changes that might indicate health issues. Changes in gait, urinary tract infections, itchiness, medication reminders, etc.
- Time spent in proximity to my other pets
- I'd like to know where my pets spend the most time during the day. Also, my dog is in a kennel during the day - is she unhappy being there or would she rather have a larger space? She goes in willingly, but I always feel guilty about it.
- is he barking at people while I'm away at work?
- How bored they are when I am gone
- id like to know how horny my pet is
- I can monitor and adjust for nutrition by weighing the pet periodically and adjusting feeding amounts. But when pets escape it's nerve-wracking. And the litter box issue (how dirty is it, is it time to change out all the litter wholesale, etc.) is a pain with cats.
- though probably not possible. know if my cat jumps on top of the counters when I'm away
- for arboreal species like reptiles, I would like to know if they rapidly fall, which could be fatal. Also, humidity levels and temperature.
- what their body language tells us
- pet heart rate seems to be an somewhat meaningless expression as it depends on breed, size, etc. It really can't be compared as "easily" as human heart rate. If you were to incorporate something like this you would need a means to interperate the data.
- thoughts
- I'd like to know of irregular skin activity on their skins

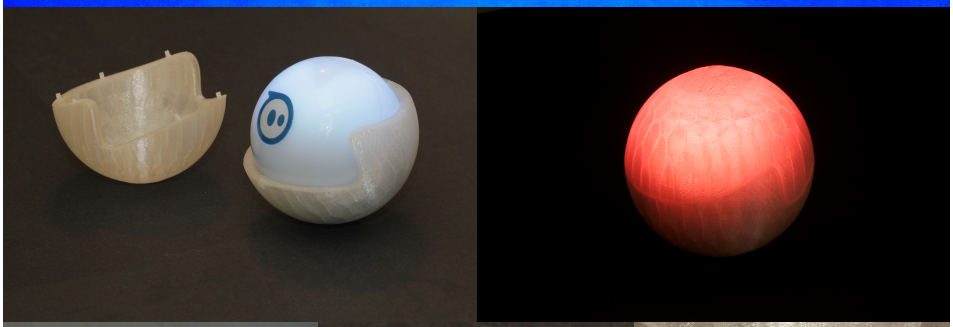
Low-fidelity prototypes of the BALL™ and Catometer™ devices.



CAD 3D modeled prototypes of the BALL™ enclosure and Catometer™ device.



3D printing the final prototypes with a MakerBot.



The BALL™ enclosure plus the Sphero robot placed inside for behavior prototyping.

Detail shots of the final prototypes, including the colored version of the Catometer™.

Survey Conclusions

- Knowledge of **activity level** and **average heart rate** were not considered as important as **sleeping patterns** and **nutrition information**, though some participants commented on **boredom**, **stress levels**, **anxiety**, **body language**, and **emotions**.
- The lack of interest in pet activity level and overemphasis on nutrition information suggests that the risks of pet obesity may not be well-known within this set of participants, or that they simply believe their pets are getting sufficient exercise already.
- **Pet location** or "where my pet spends the most time during the day", both in- and outdoors, held importance for certain pet owners.
- Pet behavior could vary by breed and individual, according to some participants' comments.
- Some participants suggested other health stats, such as waste cycle or hydration levels.
- Other participants noted the benefits of being informed of **changes in behavior**, especially those that might indicate **health issues**.

The Design Question

Based on statistics, basic evaluations of existing products, and our survey results, we decided on the following design question for this project:

> "How can we help cat owners remotely monitor and engage their cats in healthy activities?"

Prototype Concepts

Based on our research and observations, we decided to conceive of new system consisting of two parts—**a mobile app** and **smart devices** named "goodies"—which work together to ensure a cat's health and longevity. In this section we describe the design decisions made for each part of the system.

Catometer™: A Cat Monitoring Device

This was decided to be a wearable device for cats, similar to a Fitbit-style pedometer, that would record and broadcast various behavior patterns of the cat, such as his or her activity level, sleeping patterns, and whereabouts during the day.

BALL™: A Remote-Controlled Play Buddy

The idea behind BALL™ was a device that would "poke and play" with the cat while the owner is away without causing disruption and destruction to the house. The Ball is a smart device that initially maps the house layout and then allows the owner to play with the cat remotely either via direct remote control or by pre-programing the ball.

WorkMeowt™ App for iPhone

A monitoring and interaction app for mobile devices would bridge

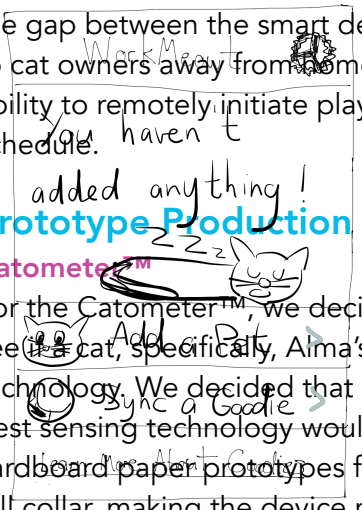
The first screen of the WorkMeowt paper prototype, describing the app and prompting users to log in.

the gap between the smart devices and cat owners. The app would provide useful information to cat owners away from home, such as activity tracking, notifications and reminders, and the ability to remotely initiate playtime to help keep cats active, regardless of the owner's busy schedule.

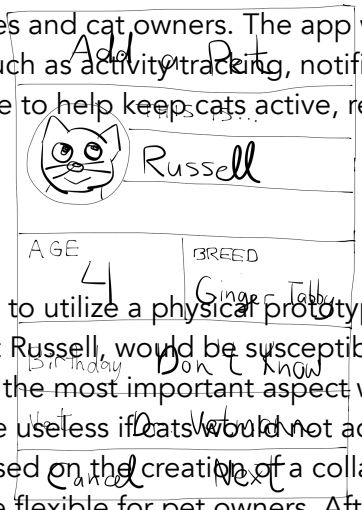
Prototype Production

Catometer™

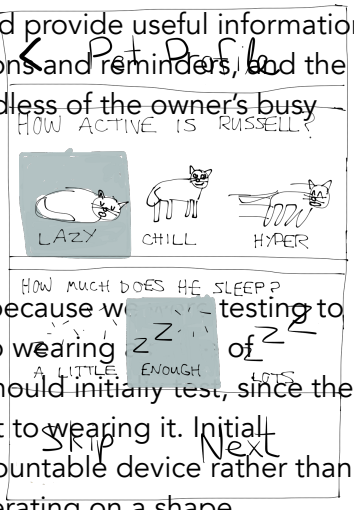
For the Catometer™, we decided to utilize a physical prototype, because we [illegible] testing to see if a cat, specifically, Alma's cat Russell, would be susceptible to wearing a [illegible] of technology. We decided that was the most important aspect we should initially test, since the best sensing technology would be useless if cats would not accept to wearing it. Initial cardboard paper prototypes focused on the creation of a collar-mountable device rather than a full collar, making the device more flexible for pet owners. After iterating on a shape resembling an infinity symbol, we made a form factor which echoed the shape of a cat's body. This design inspiration was further embellished when modeling a higher-fidelity Catometer™ prototype in Rhino3D, intended for 3D printing. At this stage, the device took the form of a chubby, beady-eyed cat with its tail wrapped around its body. We envisioned the device having two buttons for power and reset, w[illegible]splay activity and battery status. The form was so aesthetically successful that used a 2D version as WorkMeowt's logo.



An "empty" home screen that greets new users, prompting them set up their smart devices.



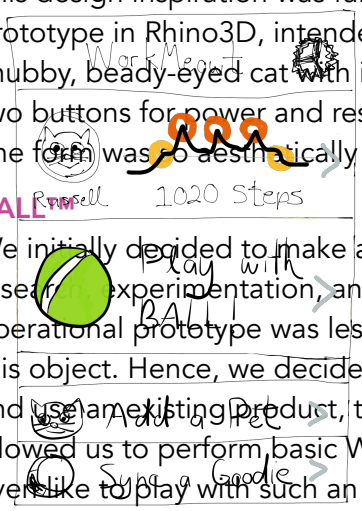
The user interface designed to allow owners to input information about their cat.



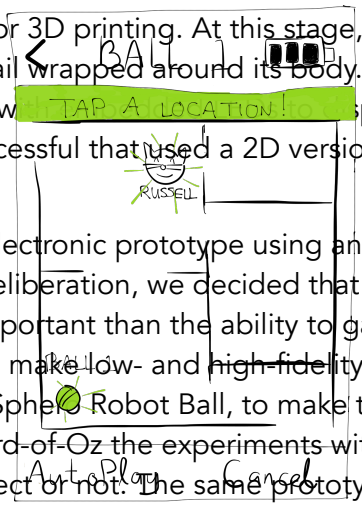
One of two initial Pet Profile screens asking owners about their pet's demeanor and activity levels.

BALL™

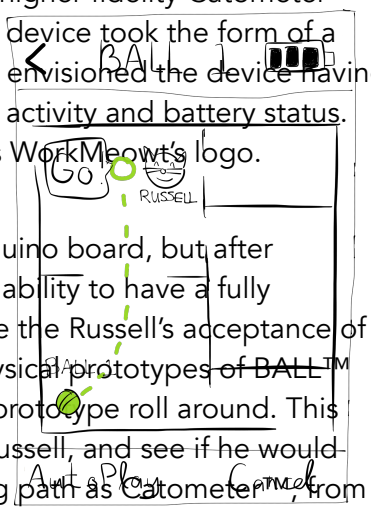
We initially decided to make an electronic prototype using an Arduino board, but after research, experimentation, and deliberation, we decided that the ability to have a fully operational prototype was less important than the ability to gauge the Russell's acceptance of this object. Hence, we decided to make low- and high-fidelity physical prototypes of BALL™ and use an existing product, the Sphero Robot Ball, to make the prototype roll around. This allowed us to perform basic Wizard-of-Oz the experiments with Russell, and see if he would even like to play with such an object or not. The same prototyping path as Catometer™, from cardboard (and tape) to 3D printed model, was chosen for BALL™.



The home screen, now showing a monitored cat (with activity summary) and a BALL™ goodie.



The "Play with BALL™" interface showing a floor layout of the owner's home.

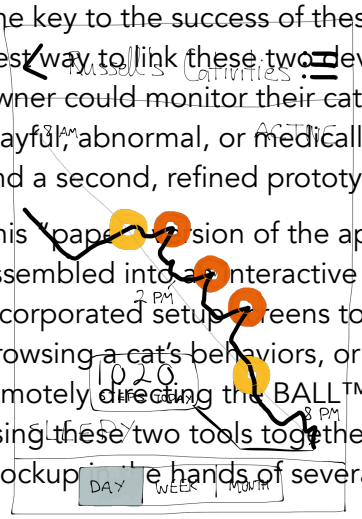


The BALL™ interface showing the path drawn by the owner to move the BALL™ to play with the cat.

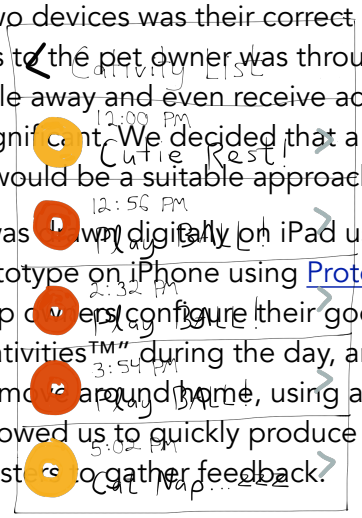
Linking BALL™ and Catometer™ with the WorkMeowt App

The key to the success of these two devices was their correct integration. We decided that the best way to link these two devices to the pet owner was through a mobile app. That way the owner could monitor their cat while away and even receive activity notifications, whether playful, abnormal, or medically significant. We decided that a paper prototype, user testing, and a second, refined prototype would be a suitable approach.

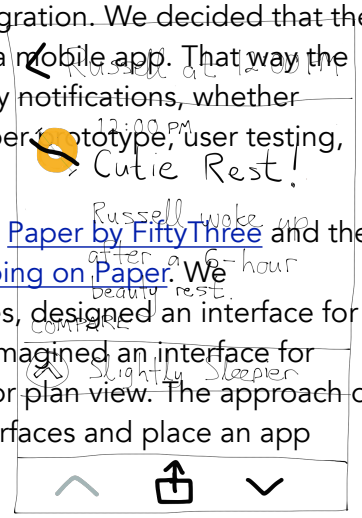
This "paper" version of the app was drawn digitally on iPad using Paper by FiftyThree and then assembled into an interactive prototype on iPhone using Prototyping on Paper. We incorporated setup screens to help owners configure their goodies, designed an interface for browsing a cat's behaviors, or "Cativities™" during the day, and imagined an interface for remotely directing the BALL™ to move around home, using a floor plan view. The approach of using these two tools together allowed us to quickly produce interfaces and place an app mockup in the hands of several testers to gather feedback.



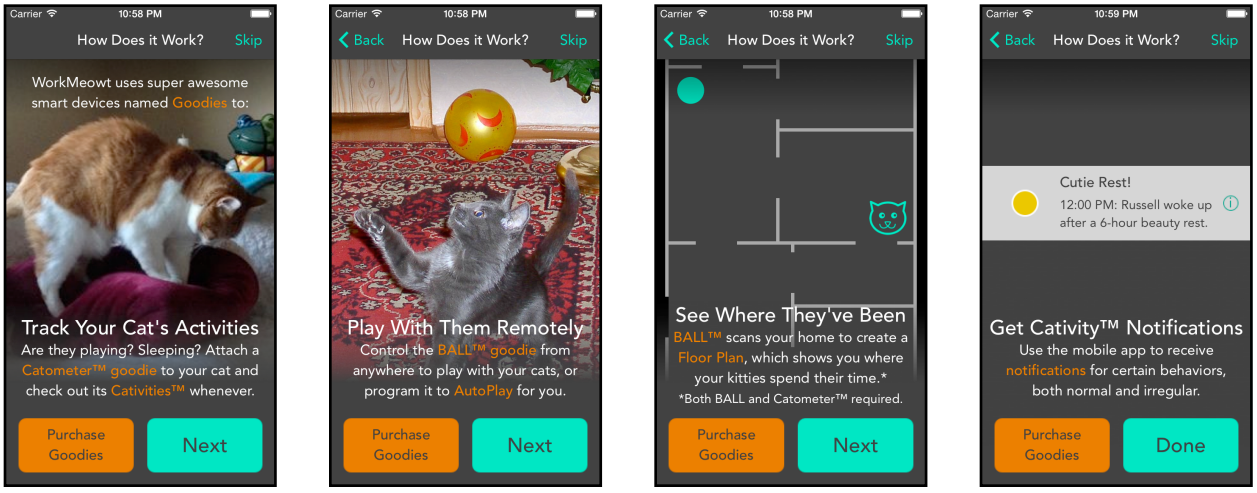
A diagonal graph visualization of a cat's "Cativities™" during the day.



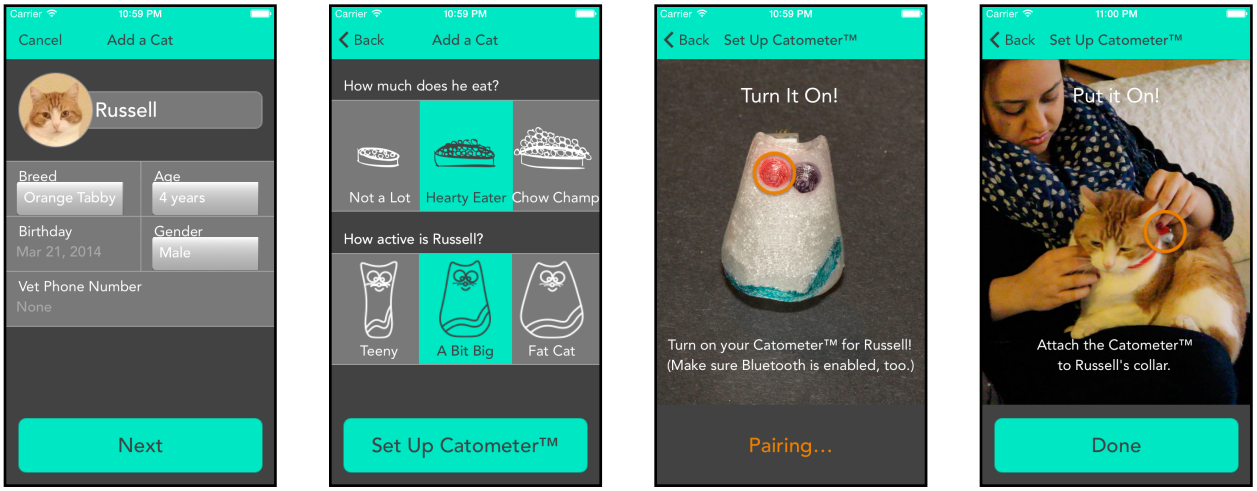
An alternate list of Cativities™, which testers found less confusing.



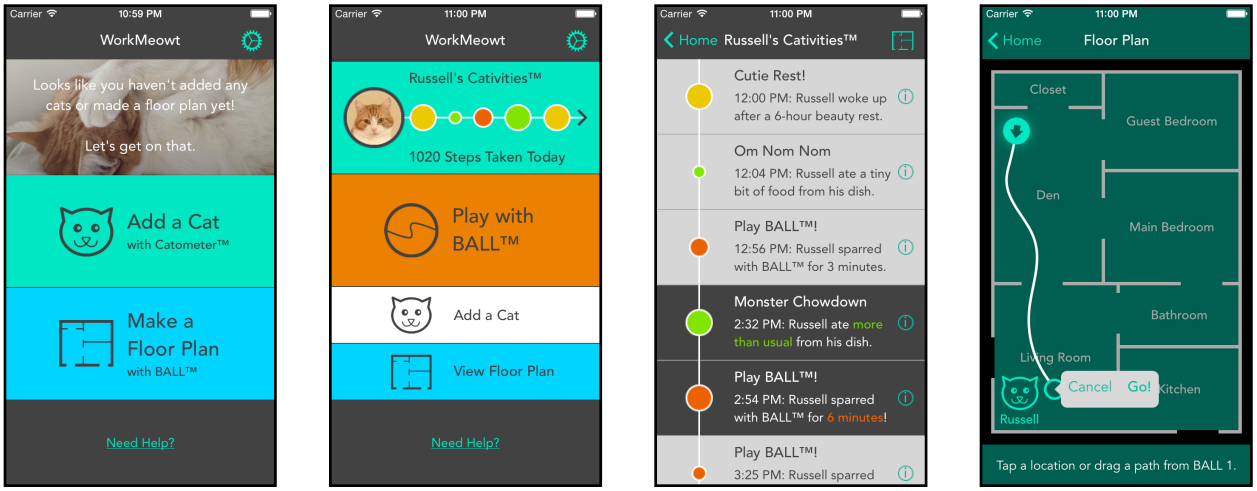
A Cativity™'s details, describing and characterizing the behavior.



Four welcome screens describing each part of the WorkMeowt system to first-time owners.



Screens from the sequence of adding a cat and setting up a Catometer™ with WorkMeowt.

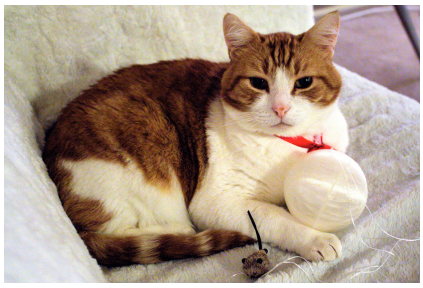


From the left: the initial home screen (with no cats or goodies), the home screen with a monitored cat and configured BALL™, the revised Cativities™ list, with abnormal events shown with a darker background, and the Floor Plan / Play BALL™ view.

High Fidelity Axure Prototype

Feedback from the paper prototype version of the app helped us make several refinements to the design and planned functionality of the app. A higher fidelity version of the same user interface was thus created using Axure. The biggest requests were more information about the system and a clearer display of the cat's Cativities™, so we refined, clarified, and simplified.

Alma's cat Russell, happily modeling the Catometer™ prototype around his neck.



Russell, having finally learned to stop worrying and love the BALL™.

Evaluation and User Testing

Testing Catometer™

Our primary testing purpose for Catometer™ user testing was to see if cats would accept wearing an extra piece of equipment on them. We attached the Catometer to the collar of Alma's cat, Russell for two days and observed his behavior. During this period, we saw that as long as the device was tightly secured on the collar and above or to the side of his neck, he had no problem with it. If the collar slipped and was lose and dangling under his chin, however, Russell would try to bite off the Catometer™. Hence, we concluded that the final design should have a fastening mechanism that prevents the device from slipping down the cat's collar.

Testing BALL™

There were two main reasons for making this prototype. Firstly, we wanted to see if this was an engaging toy for cats. Secondly, we wanted to see if this motorized ball would be able to roll around the house and engage the cat without causing destruction at house. Unfortunately, Russell found BALL™ to be very scary, refusing to play with it when moving on its own. He did find it engaging and fun to play with when it was inert, however! We do not think that this means that all cats will react this way to the toy, as cat owners and pet care experts alike stated that cats are usually attracted to fast-moving objects. Having BALL™ chase cats around the house would certainly be one way to increase their activity levels, that's for sure!

Testing the WorkMeowt App

We built the paper prototype app early on in the project, so we were able to test it with three cat-owning participants, which were asked to perform tasks such as setting up a Catometer™, reviewing their pet's Cativities™, and playing with their cat remotely using BALL™.

The majority of feedback was positive: all three participants were intrigued and supportive of the core concept. The biggest stumbling block was the app's glossary, which was related to the fact that the participants hadn't necessarily pictured the whole system in their heads yet, even with our pre-testing verbal description. Also, the paper prototype included a diagonal line graph visualization of a cat's Cativities™ which all three testers found confusing. A final

problem was the lack of instructions in the BALL™'s floor plan interface. We also received a suggestion to use the floor plan to show the owner how cat's location varies during the day.

User testing the WorkMeowt paper prototype according to a task scenario, with a bit of help from Linda Wagner.

Refining the Prototype Concepts

Feedback from our testers undoubtedly influenced the overall system concept of WorkMeowt. By the time we had started to build the high fidelity app prototype, we had decided to enhance the BALL™ concept's floor plan feature. This floor plan capability was originally conceived of to support remote play with BALL™, but based on the feedback we received, we imagined combining interior location tracking technology, the Catometer™, and the BALL™'s floor plan to show owners how their cats move around the house during the day. We did not have time to further develop the interface for this feature, but we envisioned a "heat map" visualization of the cat's location data. This idea, if not the interface, would likely require the interior floor plan to work at all, so we reconsidered the system not as a host app, a cat tracking device, and an optional play toy, but as a truly integrated system of three closely linked pieces.

Other feedback we received in person when describing the concept and demoing the app was very positive. Everyone who saw the concept was excited to see a product that would allow them to not only remotely play with their pets, but also give them insight into their cat's daily activities. Several people said they would consider buying such a product. Finally, most people grinned gleefully upon deciphering the wordplay in the "WorkMeowt" branding.

Additional Multimedia

WorkMeowt Concept Video

In addition to producing physical and software prototypes, we created a concept video for WorkMeowt, which is available on Vimeo: https://vimeo.com/89122747

Online Versions of the Mobile App Prototypes

You can view both mobile app prototypes online:

- Paper Prototype: https://popapp.in/projects/53127dad2527f65f0a154597/preview
- High Fidelity Prototype: http://40dg17.axshare.com/workmeowt.html

The prototypes can run in full screen on iPhone by adding them to the home screen with Safari.