"Pimp My Roomba": Designing for Personalization

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ABSTRACT
We present a study of how householders personalize their domestic vacuuming robot, iRobot's Roomba™. In particular, we build on Blom and Monk's [3] theory of personalization that argues that personalization does not only occur naturally but can also be induced by design choices. In this study, we created a "personalization toolkit", which allowed people to customize their Roomba's appearance and distributed it to 15 households. Our observations of these households provide empirical support that personalization can facilitate positive experiences with a Roomba, and having materials to hand can increase the odds of customization. We conclude by discussing design implications for personalization.

Author Keywords
Personalization, Domestic Robot, Qualitative Study

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H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Recently, personalization has become a topic of interest because of its ability to provide a better user experience in this era of mass-technology [4,10]. Blom and Monk define personalization as "a process that increases personal relevance to a system by altering distinctiveness of its nature" [3]. Studies report that personalization positively impacts human-technology relationships. For example, online services that provide information and knowledge tailored to individuals have more satisfied customers [1]. Also, applications that allow users to configure interfaces to reflect their own identity [10] have seen increased use [6]. However, existing studies about personalization have largely focused on screen-based user experiences, particularly e-commerce and web applications [7]. Less research has been done to understand the personalization of off-desktop-interfaces (except for [2,3]).

This omission seems surprising given people's enthusiasm for customizing physical devices, such as cell phones, MP3 players and laptops. People hang luck charms on their cell phones, purchase personal ringtones, and even create customized skins from professional services (skinit.com). Existing empirical studies find that this type of personalization leads to increases in ownership satisfaction and perceived ease of use [2,3]. More interestingly, researchers find that personalization does not only occur naturally but can also be induced by other factors, such as peer-pressure and media influences [3].

In this study, we build on the idea that personalization can be encouraged, and hence, we created a "personalization toolkit". The toolkit consisted of stickers and letter sets with which people could aesthetically customize their robot. We incorporated this toolkit into a six month study of domestic Roomba usage. We focused on Roomba because our previous studies have identified that owners customize this robot [8,9]. We wanted to understand whether personalization led to positive outcomes in people's experience with technology. We begin by describing our study methods and participants, followed by reporting findings about how people personalized and why. We conclude with design implications for personalization.

STUDIES: METHOD AND PARTICIPANTS
Our six month study involved 30 households in Metro Atlanta area in U.S. Each household was given a Roomba for six months, and we visited repeatedly to understand patterns of long-term adoption and use. We gave a personalization toolkit to 15 of the 30 households when we initially brought them the robot. For the other 15 households, we did not directly inform the possibility of customization. By giving toolkits to just 15 households, we were able to contrast the differences between those who knew customization was possible and had some tools to do it and those who did not. During the six months, we followed up with the households who personalized their robots focusing on who personalized, why and how. At the final interview, we asked all 15 households who received the toolkit, why they chose or not to personalize, and if they did what it added to their overall Roomba experience. The personalization toolkit (Figure 1) included three types of

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stickers: abstract shapes (circles and swirls), more concrete shapes with meanings (flowers), and finally lettering sets. Additionally, we created coupons so participants could get two complimentary Roomba skins (irobotskins.com). Further, we provided a booklet that we designed to inspire them by showing how Roomba owners had given their robots names and personalities, and dressed and skinned. We walked through the personalization materials and the booklet to make sure that each participant understood the toolkit properly. Finally, we emphasized that it was their choice whether or not to personalize, and that they were free to use their own tools if they choose to do it.

Figure 1. Personalization Toolkit

After the data collection was completed, we transcribed the interviews and coded the parts pertaining to the personalization toolkit for this paper. Our coding was guided by the four effects of personalization: perceived ease of use, recognition of mine from others, reflection of personal identity, and feeling in control [3]. We used these to narrow our focus in coding as guided by [5].

Our participants consisted of 48 householders (22 men and 26 women, mean age=42) across 30 households. We had 17 married and 13 single-head households. Whether married or single, we had 15 households who in total had 23 children living in the house during the study (i.e., not counting those living outside the home). The mean age for children was 10. We would describe 19 of our participants as technical. We defined technical if they had received professional or academic training, or reported having technologically-oriented hobbies such as hacking. We tried to balance the demographics of the 15 households who received the personalization kit with those who did not. For example, we had 26 people participating from the 15 households (13 men and 13 women, mean age=40). Plus, we had 8 households with 13 children whose mean age was nine, and nine of the 26 people we considered technical.

FINDINGS: WHO PERSONALIZED AND WHY?

Ten out of 15 households who received the personalization toolkit went to the effort of going online to order skins, or used the stickers and letter sets we provided. However, not all of the ten households customized their robots. Four households decided not to personalize it, not because they lacked interest, but because they did not find any of the existing skins attractive enough to be used on a daily basis. Two gave up looking for the skins they liked, and the other two purchased skins but decided not to apply them after having seen it in person. Consequently, we had six households that personalized their robots (Figure 2). Among them, two households used Roomba skins while the remaining four used letter sets, markers and stickers to customize Roomba's appearance.

Figure 2. Personalized Roombas

Motivations for Personalization

Researchers report that people are motivated to personalize technology as a form of self-expression (identity projection) or when they use a technology a lot and know how to customize it (technical identity projection) [2,3]. We learned about other reasons. Our participants personalized Roomba to express its identity, to show its value to the household, and to make it stand out from or disappear into the home environment.

In our study, we saw cases of personalizing to reflect the Roomba's identity including its name and gender. For example, a 9-year-old girl from P29 decorated Roonie (Roomba's name) to give it a "masculine look because he is a boy". Also, P27 reported that when they skinned Roomba, it felt equivalent to calling it a name because it increased its "individuality". A 10-year-old boy from P25 spoke similarly but also applied this to other things he possessed as well. For example, he decorated his guitar to give it a more "rocker-look" saying that "guitars aren't meant to be pretty" which he contrasted with his violin saying he would never customize to maintain its classic characteristics.

Also, two householders (P15, P27) decorated Roomba as an expression what it meant to them. P15 felt Roomba was a "life changing experience" and decorated it after the first week to express her gratefulness for its assistance. She wrote on her Roomba: *Our Baby, Life Saver*. By contrast, P27 did not customize until the 5th month of usage despite liking their Roomba. They looked into the possibility of getting the skin at the beginning of the study but did not pursue it at the time because they could not find a design they liked. Then, in the 5th month, Roomba stopped working after encountering water, and both adults in the house engaged in a lengthy effort to fix it. Rejoicing in their

success, they decided to get a skin to give Roomba a reward for coming back to life. In their words:

"(p27) …after we fixed it we got the skin for it…to show how we love it, how much it means (to us)."

Finally, we learned that people personalize for practical reasons, such as making Roomba stand out or disappear into the home. P25 decorated Roomba not only because he "liked" the robot from the very start, but also because he wanted to make the small, round Roomba more noticeable. At the same time, we heard the very opposite reason for personalizing Roomba: to make it blend into the home. Both P23 and P17 talked about getting a skin that helped Roomba blend in with the interior of their homes. Both ended up not getting skins because the current selection of skins did not help with this (i.e., having smiley faces and a large eyeball). P23 thought that the cheap plastic look of Roomba went against the entire theme of his house (a high-end metallic look) and ended up hiding it behind furniture, which led to decreased usage. In his last interview, he told us that he would have used it more if he could find a skin that helped the robot look high-end, which he thought was actual identity of Roomba as well as being more compatible with his home. P17 also commented on fit, when he said that he wanted to skin Roomba to match his floor covering, so that it was not as noticeable.

Impact of Personalization

All six households who personalized Roomba reported that they felt more connected to the robot, seeing it as "more like *our* Roomba instead of *a* Roomba". This suggests that personalization helps Roomba users to feel increased attachment with the product, as the literature suggests [2,3]. However, our participants also said that personalization deepened their acceptance of Roomba as a member of the household. For example:

"(P24 Mom) when we didn't put any decoration, it was just a robot. After decoration, it feels less mechanical. I feel closer to it. It feels like an entity"

"(p15) after decorating, it made me feel more committed using it. It just made it a part of our family. Not just a machine or a robot, but a part of family."

Further, such view of Roomba led some participants to think it performs better.

"(P24 son) it feels like it can get more stuff done better cuz it's closer to human now."

This emotional connection between humans and robots leads to positive user experience such as, promoting longer-term use by encouraging people to take the time and effort to maintain it [9]. Our findings suggest that personalization helps achieve this connection.

Who Did Not Personalize and Why?

We learned lessons about technology personalization not only from those who had done it but also from those who chose not to do it. Five out of 15 who received the toolkit did not choose to personalize. Three households (P13, P18, P22) listed their personality that did not find the idea of "decorating machines" intriguing as reasons for not having personalized. In addition to this personal preference, we found decreased sense of ownership was another reason for not having personalized. For instance, P16 told us that she would definitely customize as she enjoyed and taught such activities at an elementary school. After six months, she reported that she did not feel motivated to go through the effort as her husband became the primary user of the robot. And her husband told us that he would not care about modifying its look when that did not add any practical value. Lastly, we found that the amount of effort that goes into customization impacted the motivation. For example, both adults in P19 found the idea of customization, getting a skin in particular, interesting. Later, they told us that it seemed to require "a lot of work" to get skins and therefore, wanted to leave it until they had the time to do it. When prompted about the toolkit after six months, they reported that they had forgotten about the toolkit as it was kept in a less visible area, the closet.

None of the 15 households who did *not* receive the toolkit customized their robots. Among those households, two (P11, P30) explicitly asked for our permission to purchase Roomba skins. However, they did not get the skins, or apply any other type of customization since it required some effort to go online and purchase.

Overall, our study shows that various factors exist for not having personalized the robot. Some factors such as personal preference and decreased sense of ownership may be difficult to overcome with design solutions. However, other factors including perceived complexity of the customization process can be improved with the help of design. In the next section, we discuss implications of designing for personalization.

DISCUSSION AND CONCLUSIONS

In their research, Blom and Monk [3] argue that personalization does not just occur naturally but can be encouraged through appliance design choices. This raises a question for designers: is there any reason to include features that encourage personalization of a technology?

Our study suggests an answer: yes. Participants who personalized said that it deepened their acceptance of Roomba and even felt committed to using it more. Although the existing literature on Roomba usage shows that such a strong emotional engagement can exist without personalization [9], our study suggests that customization can help accelerate that process.

Further, we learned that people need encouragement to personalize. None of the 15 households who did *not* receive toolkits customized their Roomba. Indeed, only six of 15 households who received the toolkit actually personalized their robots. Our toolkit helped some, but not all participants to customize their robot. Neither the available

skins in market nor the stickers and letter sets we provided gave sufficient incentives to many participants to personalize their robot. Three participants decided not to customize because it seemed to require too much effort. This suggests that designing for personalization requires more end-user support than what currently exists. A contribution of our study has been to identify new incentives for personalization. In addition to expressing a user's identity, participants wanted to give their robot an identity. One concrete suggestion we would make to skin providers is to support custom skins that let people design ones that speak to their perceptions of their robot: its name, gender-focused looks and more.

A second novel reason we found for customization concerned the integration of the robot into the home. Participants wanted Roomba to blend with the aesthetics of their houses, so that it could be among their displayed possessions (and therefore in use) as opposed to hidden (and not used). Yet, the cartoony and collegiate skins did not match the décor of some houses (i.e., high-end loft), so people decided not to customize. One interpretation is that this is a mismatch between the Roomba as a technology versus a domestic appliance. And yet, we see recent design trends that are transforming previously white or chrome appliances into colorful and customized systems[1]. Further research is needed to understand all the dimensions of personalization, and the different desires end-users have when they seek an aesthetically pleasing appliance. But our study suggests that while some wanted appliances that stood out, others wanted ones that blended in.

A third characteristic of robotic personalization is that it needs to be durable. In the P15 household, Roomba constantly bumped into the furniture and walls, and consequently scratched off all its lettering. To prevent that same problem, P29 put tape over their lettering. Personalization needs to endure daily wear and tear.

Fourth and finally, we also saw how collaborative customization demands that personalization be easily removed. For example, P29 decorated and redecorated Roomba over time, not being satisfied with what other members of the householders had done. The P24 household purchased two skins for the same robot, one representing Mom's school and the other for the son's. They negotiated that they would first apply son's school skin to the robot and then replace it to Mom's after a while. They even experimented to make sure that the skins peeled off easily. Collaborative customization has not been addressed in the literature, to the best of our knowledge, because of the frequent association of technological experiences with an individual. For example, most computers presume one user at a time. And yet, the household is also an inherently collaborative environment. We suggest that there is much left to know and call for further studies about how to support householders in collaborative customization.

To conclude, we presented a study of robotic personalization. We learned that personalization can facilitate positive experiences with a Roomba, and having materials to hand can increase the odds of customization. We also identified new reasons to personalize, to express a technology's identity and to make it fit into the home. We saw challenges for durable and flexible customization to accommodate the work that the robot does and the presence of multiple householders. Although we focused on Roomba, we hope our findings contribute to the growing interest in personalization of technologies.

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