

# Reverse Alarm Clock: A Research Through Design Example of *Designing for the Self*

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**Abstract.** This paper documents a first attempt at “designing for the self”, an approach to designing products intended to help people move closer to their idealized sense of self as they perform a specific role through the interaction with a product. This work follows a research through design approach, applying theory from consumer behavior research to address the needs of dual-income parents with young children. The clock, called the reverse alarm clock attempts to meet the goal of “Design for the Self” in four ways. First, the clock communicates information about time in a form children can understand, and so help children learn to become more responsible. Second, it gives parents more control over their lives by allowing them in absentia to relatively control the expression of time to their children. Third, the interaction with the clock has been placed within the intimate bedtime ritual parents and children share. Fourth, by keeping young children from waking their parents in the middle of the night, the clock increases parents’ emotional reserve to deal with the morning rush. This paper details the design process and evaluation of the reverse alarm clock and provides our insights on designing for the self through the reflection of our process.

## Categories and Subject Descriptors

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H.5.2: User interfaces, User-centered design

**Keywords:** designing for the self, social role, consumer behavior, material possession attachment, parents, children, bedtime, wakeup, clock, time, alarm clock.

## 1 Introduction

Within the HCI and interaction design communities there continues to be an ongoing transition and expansion of scope from focusing narrowly on making work tools that improve efficiency and effectiveness, to a more recent focusing on improving the quality of people’s lives through their interactions with technology. Interaction designers have traditionally focused on aspects of usefulness, usability and desirability [26]. However, with the shift to experience design, issues such as interaction aesthetics [11] and social pleasure [2] have become a normal part of the design discourse. In this new age of experience design, we posit that one valuable opportunity for advancing the development of pleasurable products is to focus on opportunities where products can play an explicit role in helping one become who they desire to be.

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For the last twenty years, consumer behavior researchers have developed theories on how people develop and maintain attachments to their products through an ongoing process of identity construction. People incorporate new products into their lives and choose to keep or discard old ones as a method of both understanding who they are and constructing who they wish to be. This view of products as being implicit participants in the identity construction process has, however, been largely ignored by the design community, and, to the best of our knowledge, has not been considered in a design process. We see a real opportunity to advance the design of pleasurable products by actively searching for opportunities where interactive products can more explicitly engage people in identity construction activities. We call this design approach “designing for the self.”

In order to advance this approach, we have conducted a design project to develop an alarm clock. Called the “reverse alarm clock,” this product has a primary purpose of helping parents feel like better parents, and it has a secondary related purpose of keeping young children from getting out of bed in the middle of the night and interrupting their parents’ sleep. The clock attempts to achieve this in four ways. First, the clock’s daily setup provides a “parenting moment” where parents can enact the role of parent and invest time and attention on their children. Second, the clock creates an opportunity for 2 to 4 year old children to practice making informed decisions by presenting the information of time in a way that the children can easily understand. Third, it provides parents control over the variability and complexity of their schedules through a relative display of time. Fourth, it helps to prevent young children from waking their parents, giving parents more emotional reserve to remain calm during the stress of the morning rush.

In this paper we present a brief overview of consumer behavior theories on product attachment in addition to previous interaction design work on the waking-up experience. We then describe our design process, followed by a detailed overview of the reverse alarm clock and the evaluation of the clock we performed to parents with young children. Finally, we reflect on what we have learned about designing for the self, and outline our plans for future development of the clock.

## **2 Related Work**

In order to situate our work within the community, we provide two different lenses: (i) a theoretical view on product attachment and (ii) an overview of preceding HCI and interaction design work on the wakeup experience.

### **2.1 Consumer Behavior**

William James, in laying the foundations for the modern view of the self, noted that people consider their possessions to be a part of their self [16]. Russell Belk formalized this idea in his seminal paper “Possessions and the Extended Self” in which he describes how people construct their identities through the people, places, and products they possess [4]. Building on Sartre’s three states of existence (having, doing, and being), Belk describes a social process of self construction. A person will first imagine how others will react to him/her as a result of her possession and use of a

certain product. Once the person possesses the product, she notices how people react to the product and her use of the product. Through her *having* and *doing*, a person develops a sense of *being*, an idea of who she now is or will be because of her relationship with the product. This idea has become a cornerstone for consumer behavior research over the last 20 years. Recently, the issues of roles and narrative have emerged as two important themes in the application of this theory [1].

In looking at identity construction, psychologists have observed the importance of stories. McAdams offers a life-story model in which people construct a coherent sense of themselves by integrating stories from their past, experiences from the present, and imaginings of their future [21]. Other consumer behavior researchers have built upon this theory, exploring relationships people have with brands [14], and the relationship between life stories and product attachment [18]. Their research indicate that the role a product plays in a consumer's life story has much more impact than the product's function (utility) or its aesthetics in terms of attachments. While interaction design methods such as scenario-driven design [6] and personas [7] rely heavily on the use of stories and scenarios in the design process, no interaction design method, to the best of our knowledge, currently asks designers to consider how the interaction with a product can create moments designed to become a part of users' life stories.

In exploring the relationship between identity construction and product attachment, consumer behavior researchers have also begun to explore social roles. Kleine et al. applied social identity theory, focusing on social role—people's perception of what society thinks a role means, social identity—people's perception of themselves in their enactment of a role, and ideal identity—people's idea of who they wish they could be in a role they enact [17]. In measuring the relationship between product attachment and social role, they observed that the social role and ideal identity are more significant factors than the core self in determining the selection of new products to be brought into their lives.

These theories are not unknown in the design community. Design researchers have explored these themes in terms of utilitarian relationships between products and users [28], the symbolic meanings and instrumental values [27], and how strong attachments can increase the life span of a product [22]. However, the community has yet to address how these theories on attachment can be used to augment the design process for which we attempt to do in this pilot case. In approaching this case we wanted to make a product that allows users to enact a familiar role (parenting) through their interaction with the product that will move them closer to their idealized identity. In addition, we wanted to situate the product interaction in the context of moments likely to become a part of a parent's life story. In this case we focus on placing a product within the intimate setting of the bedtime routine where parents and children build their strong bonds through the nighttime rituals.

## 2.2 Wakeup Experience

The wake-up experience has been a relatively unexplored area in the home among the HCI or interaction design communities; however, some examples do exist in literature. Zhang et al. [32] and Landry et al. [19] both take a reductionist problem solving approach, framing the wake-up experience solely in terms of efficiency and effec-

tiveness. Their respective projects focus on the technical issues of creating smart alarm clocks that can pull in supplemental information such as weather and traffic and then infer if the user would wish to wake up earlier than planned in order to address unanticipated delays.

Other researchers more in line with pleasurable products have explored the sensorial and emotional aspects of waking up. Eggen et al. conducted a survey exploring people's preferences and desires for how a smart home might participate in the wakeup activity [13]. This study found that most people were dissatisfied with the simple beeping of an alarm clock and desired a broader range of sensorial stimulation at the moment of waking up including the smell of coffee, sunlight, control of temperature both under the covers and in the bedroom, etc. Wensween et al. explored the emotionally charged activity of determining a wake-up time and cast the setting of an alarm clock as an opportunity for people to emotionally express themselves to devices [31]. De Groot and Van de Velde's alarm clock addresses both the setup and the snooze effect [12]. Their prototype clock requires users to throw a ball during the setup to express how much effort will be needed to wake them up in the morning. The farther the ball is thrown, the louder the alarm will ring. There are also novel approaches found in the commercial arena. Gauri's Clocky [23] explores the experience of the user deciding when to rise or to nap. When activated, Clocky runs away and hides to get the user out of bed, transforming the typical snooze behavior into an opportunity to playfully lure the user out of bed.

Two commercial products currently exist to address the issue of children getting up at night. The Bunny Clock [25] uses a bunny drawn on to the face of an analog clock to communicate desired behavior. When the bunny's eyes are closed the child is expected to be sleeping and when the eyes open, the child can get up. In addition, the My Tot Clock [30] uses background color on the face of an analog clock to help communicate expected behavior. This clock is expected for sale sometime in late 2007.

In general, the research efforts to date have focused on the waking up activity of a single person. The preceding research focused on the functional need of getting up on time and on the negative emotive experience of being wakened. The commercial products specifically explored the need to better communicate the meaning of time to children, but have not addressed the relationship between parents and children. Our project advances this work by framing the waking up ritual within the social fabric of a family and exploring how the waking up experience can increase the social bond between parents and children.

### 3 Process

Dual-income families represent a significant and growing demographic within the United States and Europe. These families often feel they are living in a permanent state of "rush hour" [15] as they attempt to navigate the complex logistics of coordinating the activities and responsibilities of home, work, children's school, and enrichment activities [3, 10, 15]. Parents, sensitive to the choice they have made to be a dual-income family, are predisposed to be feeling like "bad" parents - not living up to their ideal of how a parent should behave. In particular, these parents experience this

feeling during the morning rush when they have to wake, dress, and feed themselves and their children, collect all the needed belongings for the day, and leave home on time. These parents often find themselves yelling at their children to hurry in order to meet the timelines of bosses, schools, and schools buses, thereby starting their children's day on the wrong tone [3]. In framing this project, we see an opportunity to improve the quality of the wakeup experience and to help parents feel that they have endeavored closer to their vision of themselves as good parents.

Our *research through design* approach explores the wake-up routine, focusing on how interaction designers can integrate technical opportunities with behavioral theory in a context grounded by ethnographic findings thereby making novel artifacts that transform the world from its current state to a preferred state [33]. Because we did not have a model for "designing for the self," we believed that by addressing this challenge from our design strength, we could best find where the opportunities lie. In addition, we wanted to make an artifact that could become an exemplar for products that help parents improve their feelings of themselves as parents.

In selecting a focus on the wake-up routine in a family, we leveraged research findings from the 'Project on Family, Control, and Smart Homes', which collected user data on the wake-up experience, including results from ethnographic studies of dual-income families [9] and insights from a concept validation session [20]. Their project focused on broadly supporting the management of family activities. One interesting finding from their field work was the number of parents with young children, who complained their children would repeatedly climb out of their beds and wake them in the middle of the night, seriously disrupting the parents' sleep and impacting their general mood in the morning. We saw this as a perfect starting point for our project. We felt that if we could keep young children from waking their parents at nights when there are not any urgent situation, then the parents would have more emotional reserve to deal with the morning pressure, and in turn help them feel like they are acting as the good parents they aspire to be.

To understand the complexity of waking up activities, we conducted contextual interviews with four dual-income families in their homes. As part of the interviews, we asked participants to create a detailed map of their morning routines allowing them to see and explain the many simultaneous and mutually dependent activities going on between the family members (Fig.1) The visualization of the waking up activity shows the immediacy of the mutually dependent events in the sense that any missing part (a missing shoe, a lost homework) or any lost time causes a breakdown in the routine. When something goes wrong it disrupts the delicate morning choreography and causes a cascading set of failures.

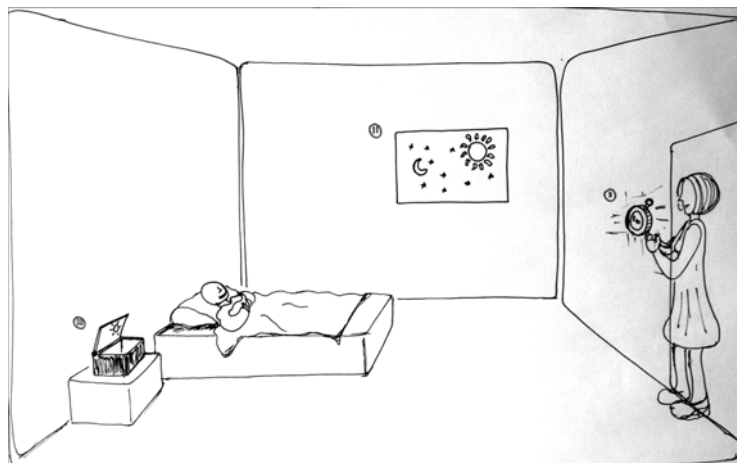


Fig. 1 An example of a morning map

Having selected the focus group, we generated a wide range of concepts to help families cope with the wakeup experience. One idea generated was the reverse alarm clock that would focus on keeping young children in bed at night. Through a process of sketching, scenario writing, and rapid prototyping, we iterated the design, searching for opportunities for the product interaction, which would help parents feel like better parents. Finally, we built a low-fidelity, working prototype and conducted an evaluation with parents of young children.

#### 4 Reverse Alarm Clock

This alarm clock for young children is functionally designed to keep children from waking their parents before it is time to get up, with the goal to make parents feel like better parents. To realize this goal, our design provides the following: (i) the opportunity for repeated “parenting moments;” opportunities for parents to invest their time and attention of their children, (ii) increased parental control over the complexities of the daily routine, (iii) increased child agency, and (iv) fewer nights of interrupted sleep for the parents. Figure 2 below provides a sketched view of the entire system.



**Fig. 2** Elements of the design; (right to left) (I) Moonset and Sunrise Controller, (II) Sky display, (III) Treasure Chest Music Selector.

#### 4.1 Design Elements

Young children frequently climb out of their beds at night and wake their parents because their sense of time is inaccurate. Piaget's theory on the time perception of children states that children begin to perceive time through the concept of 'before' and 'after' in their first two years. As they grow older, they can compare time durations. Only when children are 7-8 years old do they gain a sense of measuring time [24]. Our design focuses on 2-4 year olds whose time perception is still immature: they can comprehend 'before', 'after', and a sense of duration, but not the absolute time. To address this, our clock uses an abstract display (Fig.3) that reduces time to three states: (1) when the moon is lit, the child should stay in bed; when the moon is off, the child can get out of bed if so desired; and (3) only when the sun lights up (and the wake up music plays) does the child need to get up and start the day.

By showing time in a way they can understand, the sky display increases the children's agency. Children now have the information in a form they can process, which enables them to make an informed decision to stay in bed because it is sleep time, besides situations such as a bad dream or physiological need (being sick, need for the toilet). This approach matches the larger parenting goal of helping children to learn responsibility [10, 31], and therefore increases their chances of success in life. The alarm clock becomes a collaborator with the parents, helping parents move closer to this long-term goal without taking over the role of being a parent. In this way the clock helps parents move closer to their idealized vision of themselves as a parent that prepares their child to succeed.



Fig. 3 Sky Display for nighttime demonstrating lit moon & stars, and dimmed sun.



Fig. 4 Moonset and Sunrise Controller

The moonset and sunrise controller is a circular, wall-mounted unit that lets parents control the timing of the alarm clock (Fig.4). The control part has two physical levers that use rotational motion for setting time and provide rapid, visual feedback using traditional radial clock mapping. Sliding the levers allows parents to set the moonset time (time at which it is okay for a child to get out of bed) and the sunrise time (time at which a child must get out of bed). A digital display lets parents obtain

real-time feedback when adjusting the moon and sun knobs. The sunrise action can be easily disabled by pushing in the sun lever to accommodate days, such as weekends, when the parents allow their children to sleep until they naturally awake. In our setup, the controller is located near the bedroom's light switch. This keeps it out of the reach of young children and allows the parents to double check the setting as they exit the room.

The control unit gives parents the ability to adjust the wake time easily, providing them with *relative* control of time information communicated to their children. This allows parents to quickly make adjustments according to the days of the week or unanticipated schedule changes, such as when the child is sick or if snow delays the daycare program. This relative control is intended to help parents feel like better parents by giving them a feeling of control over their own lives [8].

Lee et al. found that parents feel like better parents when they can give their time and attention to their children through activities such as reading them books at bedtime and helping them dress in the morning [20]. These activities create a "parenting moment" within these daily routines. Along these lines, the treasure chest music selector (Fig.5) creates an opportunity for parents and children to co-construct a bedtime routine that includes music selection and initiation of the sky display. Children place a token representing a musical play list into the treasure box to make a wakeup selection and then place another token into a slot on the top of the treasure box to make their going-to-sleep music selection. To initiate the clock, the child pushes a star button on the lid of the chest.

The child's selection of music every night and the integration of this interaction with the alarm clock helps to place the clock within the confines of the bedtime routine. The design of this interaction places the clock within the intimate bedtime ritual carried on each night by the parents and children. This placement is intended to increase the likelihood of the clock becoming a memory marker of the parents and the child's life stories, allowing the system to develop a lasting attachment.

The child's bed contains weight sensors that infer when the child has climbed out. When the child climbs out of bed after the moon has set, the clock triggers the sun to light on the sky display and the morning music to play. By linking the triggering of the system's waking-up state to the child's waking up, the clock increases the child's sense of agency, reinforcing good behavior through the subtle reward [29] of allowing the child to feel in control of the device.



**Fig. 5** Treasure Chest Music Selector



**Fig. 6** Sensorial Bed

#### 4.2 Scenario of Use

Sally is a three-year-old girl who attends daycare on weekdays from 8:30am to 3:00 pm. Her mom begins the bedtime routine with a bath and tooth brushing. Having finished the cleaning, Mom and Sally go to Sally's bookshelf and pick a bedtime

story. Sally selects her music. She places a token inside the chest for her wakeup music, and she tucks a token into a sleeve resembling bed covers on top of the music box for her going-to-sleep music. Mom reads the book and informs Sally it is time for bed. Sally pushes the star button to trigger the system. Mom kisses her daughter goodnight and walks toward the door. On her way out, she checks that the moonset time is correctly set, turns off the lights, and closes the door. The music plays the songs on the play list before dwindling to silence. In the meantime, Sally drifts asleep.

Sally wakes up in the middle of the night. She sees that the moon light and stars are still on, and knows that this means it is still sleep time and that she should stay in bed.

Sally wakes up early in the morning and sees the moon has set. She decides she wants to get up. As she climbs out of bed, the sun lights up and the wakeup music begins to play. Mom, who is checking her email on her work laptop, hears the music and knows that Sally is now awake. She calls upstairs to her daughter, wishing her a good morning and that she will be right there.

## 5 Evaluation

In order to understand how parents and their young children would react to our design, we conducted an evaluation by first dressing our lab like that of a child's bedroom, complete with a bed, nightstand, lamp, toys, bookshelf of children books, and our prototype alarm clock. We then recruited six parents from dual-income families who have at least one child between the ages of 2 and 4. Each participant viewed the prototype on a separate session. During the evaluation, we provided the participants with a brief overview of the controller, the sky display, and the treasure box. We then asked them to walk through their bedtime routine, explaining how they would integrate their interactions with the clock. Following the re-enactments by the parent, we conducted semi-structured interviews on their perception of the need of a clock to keep children in bed, how they predicted their child would react to such a system, and how the device might influence their feelings of being a parent.

The design of our evaluation was motivated by Buchenau and Suri's work on experience prototype [5]. In developing our evaluation, we wanted our simulated bedroom to encourage the parents to more viscerally recall the experience of putting their children to bed, thereby allowing us to mine for more insight on design interventions that could improve the experience.

We initially intended for the parent to interact with our prototype clock with their child. However, in conducting a pilot study, we noticed the social discomfort our participating parent experienced when he asked his child to pretend to go to bed but his child. Obviously getting two-year olds to perform on command is a difficult task for any parent. In this case the parent was placed in the awkward position of having his child not follow instructions in a room full of witnessing researchers. After this pilot, we decided that we would have the parents interact with the prototype on their own.

## 5.1 Findings

Having completed the user evaluations, we held several team meetings in order to analyze the responses in detail and to share our personal observations. In general, parents comprehended the design very quickly after the walk through. One parent surprisingly shared his use of a similar idea in his family's bedtime routine. He and his three-year-old have a nighttime ritual of turning lights on or off to represent different times of the day (sleep time vs. wake up time). Another parent had a child who has a hard time waking up in the morning, for which she thought the alarm clock would be helpful. The diverse responses reflected the different family contexts and varying ages. Below we share the highlights:

- *Problem rationale*: Parents felt we had identified a real problem and wanted to be a part of any testing of a real system. They were eager to have a solution for keeping their children in bed. One parent shared that she had recently removed her three-year-old son from his crib, and that she had then experienced the worst three weeks of her life. She said her son was now back in the crib.
- *Design rationale*: The majority of the parents liked the use of the sun and moon representations in place of a more traditional clock. In general, they felt their children would understand the display and the behaviors it mapped to.
- *Music selection*: Many parents had issues with the going-to-sleep music. Most did not use any music, and did not want to stimulate children at bedtime. Some also felt that the music would be habit-forming, becoming a requirement that is hard to replicate when the family travels.
- *Target group*: One parent felt that the proposed design might be too difficult for a two-year-old child. She suggested that it would be better if the design aims for slightly older children.
- *Wakeup function*: Several parents said they would never use the wakeup function. They wanted their children to sleep for as long as possible. However, a few parents who had children, who, in addition to waking up at night, have a hard time getting up in the morning, thought the automatic sunrise would help. Another parent mentioned that this feature would help him and his wife remember not to let their son nap too long in the afternoon.

## 6 Conclusions

The reverse alarm clock provides an example of how interaction designers can efficiently make use of material possession attachment theory in the design of interactive products. Following a research through design approach, the resulting artifact has the goal of helping parents feel like good parents. The clock achieves this goal in four ways. First, it provides an opportunity for parents to enact the role of parents as they participate in the ritual of bedtime. Second, it provides an opportunity for children to learn to make good decisions, an important life skill. Third, the clock provides parents with relative control of time, increasing their feelings of control over their hectic life. Fourth, the clock increases the likelihood of a goodnight sleep, increasing parents' emotional reserve during the stress of the morning rush.

In our attempts to design for the self, we had to work hard to keep remaining focused on the main goal of helping parents feel like better parents. At several points in the process we realized that we had lost sight of this goal and replaced it with the functional issue of keeping children in bed. We expect that our experience as interaction designers in an HCI community has given us a habit of focusing on functional outcomes, and that in order for other interaction designers to attempt to design for the self, they must be aware of this potential blind spot.

## **Future work**

We are currently redesigning the reverse alarm clock based on the feedback we got from parents. In advancing this design we are working to add the ability for the clock to communicate an expectation for the day such as “school day” or “home day” at the point of sunrise. When completed we plan to conduct a field study, placing the clock into the home of a dual-income family for an extended period of time and evaluating (i) whether the clock reduces the number of times a child wakes their parents at night, and (ii) whether it make parents feel like they are moving towards their idealized vision as good parents.

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