Team 10 Project Report:

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Waking up in the morning is currently not a very pleasurable experience. The alarm sounds jolting us awake from a good deep sleep; we hit the snooze button and return to an unconscious state for five or so minutes until the alarm goes off again. We are awoken again and drag ourselves out of bed. This experience is one of the least pleasurable experiences we as humans endure on a day to day basis. Our goal for this research project was to research the ways in which people wake up and how the wake up experience can be improved. Our research problem is that the current wake up experience is not pleasurable. We want to design a new experience that will improve the everyday routine of waking up. In order to be successful the design would have to incorporate stimuli that would make the user wake up in a more pleasurable manor. The system would have to eliminate the annoyance of a typical alarm clock, but still be effective in waking the user.

We started our research by looking through online articles about the wake up experience. We also looked at the different types of alarm clocks on the market. The different designs and functions of the alarm clocks and what their focus was on helped to determine what corporations are doing to address the issue of waking up in the morning. We were able to find a great variety of alarm clocks on the market. The functions focused on several different senses, as in sight, sound, smell, and touch. There were clocks that shook you awake, some dispensed a pleasant aroma to arouse the sleeper, alarm clocks that have both soothing and annoying sounds, and alarm clocks that gently awaken the sleeper with a gradual light change. We took all of these different types of alarm clocks into consideration.

We also took a survey and conducted interviews about how people feel about their current wake up method. We asked questions about what people did and did not like about how they currently woke up in the morning. Along with those questions we asked what could be done to improve the users wake up experience. We collected surveys from over seventy people and interviews from around twenty. The interviews consisted of similar content, asking how they currently woke up, what they liked, what they did not like, and how they would like to be woken up. The content and results of the survey and the interviews will be discussed later in this report.

After gathering all of the information, we took to the drawing board and began to design our alarm clock. We took into consideration all of the results from the interviews and the surveys into our design. We also used some of the designs from the alarm clocks we found. The first design we came up with contained too many elements and would have been extremely expensive. The second design was more cost effective and was less cluttered.

All of the aspects of our research will be explained in more detail throughout this report. We will start with the secondary research we conducted with an analysis of our findings. We will then complement that information with the details of the interviews and the survey with the results they generated and how those results could be used. We will then conclude with our designs and what work could be done in the future to further the research of a pleasurable wake up experience and what could be done with our design.

We researched extensively on the effect light has on sleep and if it is a better way to wake up rather than waking up to an annoying regular alarm clock. Since we are trying to figure out a more natural

way to wake up, we figured that light would be a natural and less annoying way to wake up, as long as it is done the right way. First we looked up the benefits of waking up more naturally with light and any other benefits it may have. We then searched to see if there are any alarm clocks out there that have light associated with the alarm itself. Finally we thought how we could improve from past alarm clocks with light on them and how we could incorporate our research with our alarm clock.

It was interesting to see the effects that light has on sleep. Whether you are falling asleep or waking up, light has a tremendous affect. It's been said that you should gradually tone down the lighting around you for up to three hours before you go to bed because it affects your circadian rhythm and tricks your mind if it is too bright. So it is obvious that light has a great deal of effect on your sleeping. Any exposure to light at night decreases the secretion of melatonin which helps us fall asleep but at the right time when you are exposed to light it wakes you up. It's imperative that light is kept away from you while sleeping because it will disrupt your circadian rhythm.

A gradual, increasing light can help you wake up in a natural way. It simulates the dawn, which our bodies have programmed themselves to think that that is a natural thing to experience in the morning hours of your day or when you are getting up. Scientific studies have shown that waking to a simulated dawn may help people feel more refreshed and wake in a better mood. As I talked about before our bodies are sensitive to light in the early morning hours and can even respond to it with our eyelids closed. Since our bodies are so sensitive to light we can respond to even the faintest light exposed to us in the morning. Which is something that can be incorporated into our design, have a very faint light gradually increase in intensity before our alarms are supposed to go off. Research has shown that humans have evolved to wake up to the sun so it is thought that a gradually increasing light sends the body a message that it is time to wake up, just like the sun. This all happens much more naturally than the loud and jolting sound your alarm clock wakes so abruptly wake you up. With a light on the alarm clock you wake to an already lighted room which is just what you need to get going.

We make it very difficult in today's society to wake up. We cover our windows completely and darken our rooms so that no light gets in in the morning. Because of this we created the need for something loud and annoying to wake us up. Research says that these loud and annoying alarm clocks add to the stress of our days. One researcher says in an article in Better Health, "Since human beings are biologically programmed to wake up to sunlight, audio awakening devices seem diametrically opposed to our biological needs." This researcher goes on to talk about how the audio triggers a response for sudden wakefulness or a sudden rush of adrenaline. Our bodies do not need that at this time of the day. This makes our body fight or run away from what is going on. In essence we awake ready to fight a battle. So the current way our society wakes up is harmful and works against what our body wants so our days get started off in terrible ways.

It's not a coincidence that people feel much more energetic and refreshed during the bright and sunny summer season when you are enjoying the natural light. Research done by Phillips says that sunshine and daylight have a positive effect on us. The research also said that when we are exposed to the right type of light, it helps to align our daily rhythm or wake us up more easily. Waking up to a simulated sunrise wakes you up naturally and makes it much more pleasant than a regular alarm clock. Light in the

morning may also fight away the winter blues that you may have when you wake up the Philips research says. Research done by Better Health pointed to having highly positive results for those who suffer from Seasonal Affective Disorder which is a disorder people suffer from that have a lack of sunlight. A light therapy in the morning can help those who suffer from SAD. So all in all we learned that a simulated dawn wake up experience on an alarm system can significantly affect you energy, mood, and happiness. Light is much more pleasant and affective that an audio wake up alarm.

Another point of interest for our alarm system was a new up and coming technology that senses when you are in your deepest sleep or lightest sleep then wakes you up when you are in your lightest sleep. We researched this technology to see if it really worked or if it really helped. We even had a couple of group members try some of the REM alarm systems to see if they really work. We had to think about if it was possible to incorporate the REM sleep cycle into our prototype and if it was cost effective also. We did some extensive research on the alarm systems out there and if the idea really works.

We looked at a couple of different resources on REM sleep cycle alarm systems and overall it had some positive results from it. The sleep cycle alarm system gives you a graph of your sleep based on you movement sensed by your phones accelerometer. It detects how much you move and then correlates that to which sleep cycle you are in. The more movement the lighter sleep you are in and less movement means you are in your deep sleep cycle which it knows to steer clear of when waking you up. When you get to the REM (rapid eye movement or dream phase) sleep stage it detects when you are in the lightest sleep during that time and wakes you up gradually. The graph is taken each night when you are asleep which then the results are accumulated and it gets more accurate when it gathers more results because it knows your sleep patterns better. So in essence it should wake you up in the time period when you are in your lightest sleep during REM and you should not feel as groggy and tired because when you are in your deepest sleep you resist waking up and feel exhausted, maybe for the rest of the day. We learned a lot about REM from our research and what this application can do for our alarm system.

Another thing we needed to look at and research in order for this technology to be inserted into our technology would have to be the possibility of it working successfully and economically. After further research about REM sleep cycle alarm systems we found that it has actually been around for a long time but for hefty price tag but now that they are coming out on iPhones for very low costs it’s revolutionizing the technology. Since there are apps already for the iPhone for REM sleepy cycle alarm systems, that would mean we could either make something cheaply or use an app on the iPhone to connect to our alarm system. This would have to be researched more though in order to figure out how economical it is so that we can use for our alarm system.

Some errors have been noticed with the sleep cycle applications and therefore could be fixed in our alarm system. Some complaints about the prior ones are that it is two quiet and therefore you need to set a backup alarm. Another complaint is that it is too erratic in that it can wake you up a half an hour before your alarm goes off or that it could wake you up a minute before it goes off which means it isn’t too accurate in predicting when you are in your lightest sleep. So in those errors we can fine tune an REM sleep cycle alarm system for our alarm system and put it in it.

We also had a few of our members test out some of the REM sleep cycle applications. The reviews were positive from them but we had some of the same problems with the application. On the positive side though the graphs taken were very helpful in finding our sleep cycles and it was fairly accurate in the general half hour range of when we were supposed to wake up. So the members who used the applications were impressed with the application and the technology associated with it.

With the research done on these two alarm techniques, which focus on more of a natural wake up experience, we hope to be able to combine them in our final prototype. Extensive research was done to figure out the economics, errors, and positives of each alarm to see if they would be the best features for our prototype.

The research that we had done on how lights affect sleeping and how light can provide a more pleasant wake up experience we decided to include this feature on our alarm system. We did find a negative in some of the alarm systems out there with the light feature, that being it started too early, so we would adjust that to just 15 minutes before your wake up time since your eyes are so sensitive to light in the morning. This would be one of the features that can help you feel better and less tired in the morning because your body is programmed to wake up to light. The person will be less prone to fight or refuse the wake up since it does not trigger that sudden adrenaline rush an audio alarm clock triggers. We think with the research done by each of us that light is one of the most pleasant ways to wake up.

The REM sleep cycle app would be a great fit in synchronization with the light for our alarm system but more research needs to be done on how to make it economical because with both of these combined it would be too costly. Although we do see inserting this in a future prototype for our alarm system right now we are just going to use the light because there is more research out there for that and more research to be done with the sleep cycle applications. It is a very innovative and effective idea once it becomes more accurate in reading your sleep cycle.

When trying to improve the better alarm clock system we had to do a ton of research to get to the final design that we came up with. There were two significant research tools that helped us out greatly where the surveys that were answered and the interviews that we conductions.

The surveys were a significant help with us because we asked a serious of question that were either multiple choice or open and from there used that to come up with a better wake up experience. The survey consisted of six questions, two opened ended and four multiple choice. The two open-ended questions that we asked were: 1. What type of alarm system do you currently use to wake up in the morning? 2. If applicable which alarm clock app do you use? The four multiple-choice questions were: 3. If you use a device that has a snooze button, how often do you use it? (On average) A. Not applicable B. 0 C. 1. D. 2 E. 3 4. What problems do you face with your current wake up method? A. Doesn't wake you up all the time B. Annoying C. Unreliable (battery dies/ unplugged) D. Too easy to snooze. 5. How would you most want to be woken up? A. Sounds/Music B. Naturally C. Light (Sunlight or Room Lights) D. Smell E. Movement (bed shaking) F. Temperature (hot or cold) 6. What is the first thing you do when you wake up? A. Shower/Bathroom Stuff B. Eat C. Watch TV D. Computer. After posting the survey through surveymonkey.com we all worked together into spreading the word of friends from the age 18-25

to answer the survey to get personal opinions. Obviously, the easiest way to attract users into answering our survey was to post it on Facebook but we also sent it out to friends that we are connected through email and asked if they could answer the questions. After about three weeks of the survey being out there, we got out 70 people to answer.

The findings that we had were significant in the outcome of our project. The most substantial information that we gained was about the snoozing effect. Most people use the snoozing button even though they feel it discloses their wake up experience with having the opportunity to sleep in longer. They said it was too easy to snooze. The snooze button is simply a button on your alarm clock that you can hit and the alarm will set back 1 – 10 minutes depending on the brand and settings. Also, we realized that during their wake up experience most people felt that it was annoying to wake up. So we put into consideration possibly making an experience that is enjoyable. With the question about how you would like to be woken up; most people felt waking up naturally would be the best way (49%) but also sounds and music (26%).

To continue on from the surveys, we also conducted numerous live interviews with people from the age 18-25. The interviews helped out greatly with our research because it gave more open-ended personal information about a person and their wake up experience. The six questions we asked were: How do you currently wake up? What do you like about your wake up experience? What do you not like about your wake up experience? Do you have an idea of what would make your wake up experience better? Do you have a roommate? Do you have a job other than being a student? The interviews were more personal with more of a variety of answers but that was still very helpful with our research. The reason why that was so helpful is because we listened to every interview as a group and from there grabbed the answers that we felt would be most reliable for making a better alarm clock system. Mostly everyone wanted their wake up experience to be more enjoyable just like the results on our survey. Who wouldn't want to have an enjoyable wake up experience? Everything that comes with waking up is drowsy so having an experience that gets your day starting right is the perfect alarm clock.

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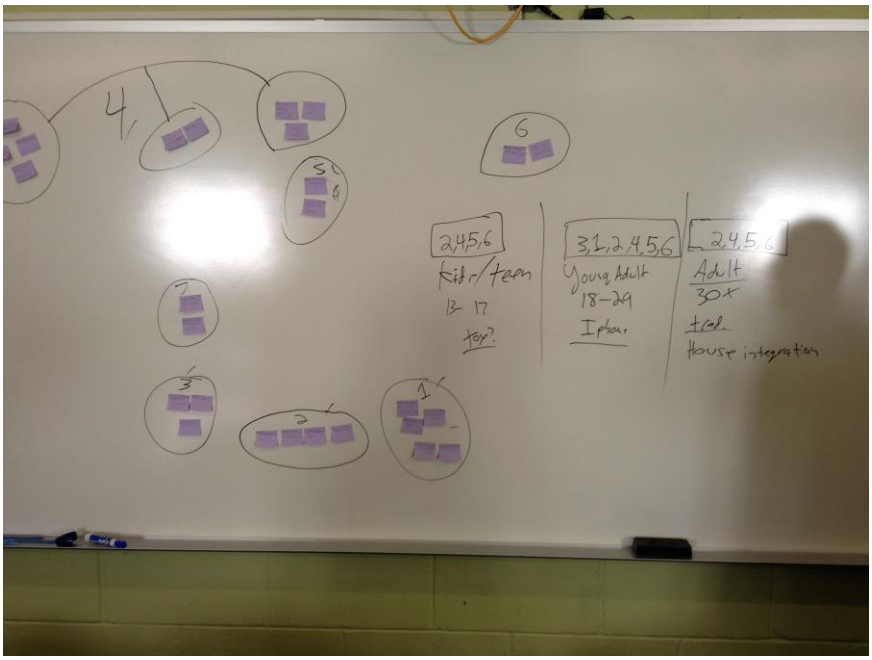

Even though you clearly can't see what the words say on the notes cards. The reason why I put this here is because after we conducted the interviews and surveys, we all got together and each put insights on a post it note about the information they felt was most meaningful towards designing a better alarm clock. As you can see, some areas had four post-it notes in it which shows that each member felt that that idea was very important when making our final designing.

From our interviews and surveys we also found other research through articles. Articles were a meaningful step in the process. Each person found articles that they felt would be useful towards our design and from there printed it out and brought it to the group meetings that we had weekly. The members would also upload the articles that they found on our Google doc that we regularly checked. The Google doc was a great way for the group members to communicate virtually. During the article research section, we found numerous ideas that we could implement in our design. The alarm clocks that we found during our research was waking up with movement, smell, motion(the alarm clock shot up a helicopter in the air and would stay up there till you put in back in the platform), light, heat and activity (with this alarm clock you would have to get your brain working by connecting three wires correctly for your alarm clock to sound off) We tried to incorporate all of these ideas into one alarm clock for our first design but realized that it wasn't cost efficient for what we were looking for. After thoroughly looking through our research, interview and surveys, we came up with our first design. Our first design was a headboard alarm clock system that would incorporate a heating blanket, vibrating pillows, light and projector for the time to be seen. We presented it to the class and realized that we were going for a reach with the alarm clock. We tried to put too much into it and didn't consider the cost especially since we were focusing on 18-25 years old at the point. That's when we went back to the planning board and came up with more a suitable idea. We removed the ideas of the heating blanket and vibrating pillows because we felt that we shouldn't

mess with the person's bed and that we don't want them to HAVE to buy our blanket and pillow. From there we improved the idea of the lighting. We found this really interesting alarm clock.

The Philip wake up light gradually lights up, as it gets closer to the alarm time that is set. We merged that into our system. The feedback from that clock was that it started lighting up too earlier so we decided to set the light function to start at fifteen minutes instead of thirty minutes. As you will see later in the article, it mentions the final design.

For a better part of the semester our team was working on collecting primary and secondary research to figure out exactly what people wanted from their alarm systems. Initially we conducted a large amount of primary research, about seventy people, and from there figured out that the biggest problems with people and their alarms were that they were too easy to snooze, they did not make the person get out of bed, they woke up that person abruptly with loud and annoying sounds and also left them feeling tired and groggy once woken up. Another less obvious but crucial piece of research came unexpectedly during the interviews while talking to the participants. It seemed as though no one was completely satisfied their current wake up experience, one could just tell by the way they talked about it. Most importantly though, they knew they did not like it but they also did not know how to fix it. This by no means made it easier on our team but it did tell us that we needed to do something different and out of the ordinary.

From there we started researching articles and other sources that majorly dealt with alternative wake up methods. We were pleasantly surprised by the amount of different wake up ideas we found. There really are a lot of good ideas out there but unfortunately none have yet to hit the mainstream market. The most interesting ideas included waking up the user by smell of coffee or bacon, a vibrating armband, a sort of sunrise simulation with soothing music, a beeping alarm clock that would actually fly away from you and one would track your REM sleep, waking you up in your lightest stage of sleep. The

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REM sleep method was fascinating because it was able to determine one's REM cycles by using an accelerometer that simply tracks the movement of the user during their sleep. It has a fifteen-minute window prior to your designated wake up time where it will wake you up in your lightest part of your sleep during that time. So in essence you might wake up fifteen-minutes earlier but the idea is that you will wake up feeling more refreshed and awake. This is an ingenious idea and is also great because it can be easily implemented into an iPod app so we thought about how to incorporate it into our own alarm system ideas.

After we had collected and analyzed all or our research our team began brainstorming ideas for our first prototype. Through our findings we most importantly concluded that people thought that their alarm clocks were annoying and that they were too easy to snooze. Also, to reiterate, they were sure they wanted a change but did not know exactly how or what to change. By drawing from previously made alarm clocks, we found through our secondary research, we started putting together some rough ideas and sketches for our first prototype. These alarm clocks that we were using as inspiration incorporated some pretty unorthodox ways of waking people up, such as smells, vibrations, puzzles, lights and REM methods. At first, we thought we had an abundant amount of ideas and so we originally thought that we would make three separate alarm clocks. Each of these different alarm clocks would be tailored to a different age group, adolescent, young adult, and adult. In the end though we figured that it would be a better project all in all if we chose one age group to focus on and create only one alarm clock and go from there. This would enable us to pour all of our effort in providing the best wake up experience instead of spreading our ideas, as well as our team, thin.

Our next step was then to come up with some sort of final idea of what we wanted to make. We decided to concentrate on the young adult age group because we thought they were open to giving new things a chance as long as it still got the job done. And since we decided to devote our attention to the young adult age group, most of our primary research came from that group, we wanted to make it different but still effective, after all our main goal was to design a better wake up experience. So anyway, we thought it would be a great idea to actually incorporate the alarm system directly into the bed so that we could put in some of the interesting ideas we gathered from the other alarm clocks that were mentioned before. First of all the alarm itself was going to be rectangular and was going to be built directly into the headboard of the bed at a size of about three feet wide and two feet high, allowing for a more seamless integration of the features we were trying to include. For example, the alarm system was going to come equipped with heating blankets, vibrators to put into your pillows, an iPod-ready speaker system, time projector, as well as an interactive, touch-screen interface. Basically the only thing we left out was the kitchen sink. We were going with the idea that more is better and could not think of anyway someone would not want to buy this product. Soon after coming up with our original prototype we set out to test it by asking potential buyers if they would in fact buy this product. Many people liked the idea of having an alarm system that potentially had so many different ways that could wake you up, but were worried about the cost of such a high-tech, alarm-in-bed alarm system, especially because most people in that age group are students or young professionals with a limited income. Eventually, because of this realization, we came to the conclusion that this design was in fact over the top and no one was going to pay the amount of money we would have to sell the bed at in order to make a profit. Realistically having

to sell a bed as well as an alarm system just was not practical and also was not affordable to the average young adult. Therefore, we scaled back the next design quite a bit to accommodate the realistic price range that our target group could meet the expense of.

Next, we started to redesign our prototype by removing features. First we took away the touch-screen interface because it was an unnecessary application that was mostly for aesthetics in the first place. In exchange for the touch-screen we inserted a simple and traditional LCD screen controlled by two up and down arrows and a menu button that returns to the home screen. Then we removed the heating blankets because it seems as though people do not enjoy being woken up by heat, especially in the summer. To be honest, waking up and being sweaty and hot does not sound like a pleasurable wake up experience. We also removed the vibrating pads for the pillows because it still seemed too complex and intricate for a scaled down design. Also, we wanted to limit the amount of wires to and from our alarm system. Lastly, the iPod-ready speaker system was taken out of the next design because we felt that it was a non-essential part of an alarm clock. It would have been a nice feature but chances are that someone that owns an iPod already has a better way to play their music than through an alarm clock. It really is more of convenience than a necessity and is really not important to what we are trying to do for this project.

For our final prototype our team wanted to go as simple as possible in order to achieve our projects end goal in designing a better wake up experience. After designing our first prototype we continued our secondary research and found an alarm clock that was similar to how we wanted our alarm clock to work and it was gaining good reviews from satisfied, refreshed customers. The Philips Wake-Up Light works by simulating an artificial sunrise, slowly lighting up the room and playing music, as the time gets closer to your desired wake up time. The music can come from either a USB drive or one's favorite radio station. Branching off from this idea we have come up with our final prototype for the project. It is similar to our initial prototype in the fact that it is a rectangular shape but instead of being built directly into the headboard of the bed it is going to hang over it. The prototype is going to have a kind of hook that allows it to hang over the top of the headboard hanging just above the users head while they are sleeping. Just like the Philips Wake-Up Light our prototype has a light on the bottom of it covered by a shade to spread out the light evenly throughout the room instead of directly into the sleeper's eyes. Also, the light will gradually get brighter during a fifteen-minute period in hopes to wake up the user in their lightest stage of sleep, sort of like the REM wake up method.

Our prototype will also play pre-set noises such as, bird songs, ocean waves, and a gentle rain starting at the same time the light does. At first the sound is very, very soft but slowly gets louder as the time approaches the designated wake-up time. The speakers playing those pre-set sounds are mounted on the front of alarm clock to project outward, filling up the room with the sound. When the alarm goes off and the user wakes up it can be easily turned off by gently pressing up on the shade containing the light on the bottom of the alarm. The time, alarm time, and sound pre-sets are controlled by two up and down arrows with a menu button to return to the home screen, as specified before. The screen will glow with a soft, blue light so it can be seen but not stimulate the eyes and keep the user awake. At the top of the alarm system prototype is a projector that shows the time and date either on the opposite wall from your bed or up on the ceiling, it is rotatable. Lastly, the alarm system has an electric plug for a wall outlet and

has batteries in case of a power outage or a blown fuse. We believe our product would be able to be sold at fifty US dollars and we would still make a decent profit.

In the future of course a few recommendations could be made to change or add to the design. Something to think about would be adding a remote control along with the design in order to turn the light on and off at will along with the sounds in order to provide a pleasant ambiance throughout the room. Another thing to think about would be to make the background lights of the alarm and the projector changeable to the user's favorite colors, like red or green. Although we designed our project to be simple and efficient people, especially in this day and age, like to be able to customize their gadgets to do specifically what they want and so more options may not be a bad idea. Lastly, another idea might be to change from having the shaded light on the bottom to either side of the alarm clock. The initial idea was to have the lights directly above the user so that it would wake them up more efficiently but it may annoy them. A solution to this would be to put a shaded light on either side so that it is not directly in the user's eyes and filling up the room with light at the same time but this is something we would most likely implement on a second remake of our alarm system after beta testing with real market customers.

Through our primary and secondary research, and the prototype we have designed, we feel that we have come up with a better, more pleasurable wake up experience. We found, through research, what many people feel would be a better experience waking up and we incorporated those ideas into design for an alarm clock. Our research showed us that there was indeed a problem with the current method of waking up in the morning and what people felt could be done to make the experience a more pleasurable one.

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