# SmartRack Proposal

Team 39

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Section 1: Introducing Campus Issues and Overview of Product

The most frequent crime on the University of Arizona campus is bicycle theft. The number of bike thefts reported on campus each year are at an unacceptable level. With this staggering statistic, it is crucial to attempt to relieve bike riders of the stress put on them through worrying about the loss of their bike. When an individual purchases a bicycle and chooses to ride it to and from class, they should have assurance that their bike will not be stolen. The introduction of the sensor for the SmartRack connected to an accessible smartphone application will ensure that any bike that is taken without permission will be not only time-stamped, but also geo-stamped to better help UAPD identify potential suspects.

The implementation and creation of the SmartRack will benefit not only the consumer, but also multiple sectors of the University of Arizona as all of the production will be done ‘in house’. The creation of the actual motion sensor would be created by the Engineering department, the mobile application created by the Computer Science sector, and the marketing aspect by Eller. With this device stemming from the University of Arizona, it could be further marketed to other large universities or even the city.

With hundreds of bicyclists zooming around throughout the campus and high speeds, there tend to be collisions and traffic. The other component to the SmartRack is the navigational part. The mobile application for the smartphone would allow a user to observe less congested routes to and from their classes. As a freshman who may be new to the campus this could be a huge benefit. They might have the U of A app
already that comes with a map, but they may not be aware of the heavy traffic that could inhibit smooth transportation to class. The last component concerns parking. When one walks around campus, overturned and shoved bikes are seen on bike racks as competition for a space is large. With this issue comes damage to bikes and an increased theft rate because a bicycle haphazardly shoved into a rack most likely is not locked to the best that it could be, and therefore has a higher chance of being stolen. The mobile application could assist with this as the sensors would relay information concerning that availability of rack space, so if there were a lesser used rack just around the corner that a user might not initially realize, they could park there instead of cramming their bike in where it might be a target to be stolen. The application plus the sensor on the actual bike rack is a product that is meant to be inexpensive and placed on every rack on campus, allowing users to swiftly cycling around with the fear of their bike being stolen.
Section 2: Introducing SmartRack

With all of the issues and crimes that are very prominent on a University campus, technology that can help deter and counter these problems is very much desired. In order to address these issues, we propose the development of SmartRack, a mobile application for college students. Introducing a technology such as SmartRack into campus life will help change and enhance students' life on campus in various ways. Our idea for SmartRack involves an innovative sensor technology that will be implanted into the current bike racks on campus. The sensors on this smart bike rack will monitor your bike's position, show general vacancy on the racks, and associate a timestamp with an unauthorized removal of your bike. This technology is not too advanced to be feasible; it is very simple technology that can be created and accessed by the average person.

As mentioned, SmartRack is not only about the physical bike rack. In conjunction with a mobile app, the duo will be able to assist a user in finding an open bike rack in a place where bikes are the largest mode of transportation. This will be made possible by inserting sensors on the campus bike racks that will relay its vacancies to the mobile app that students download. In doing this, students will be able to plan ahead and not waste any time in getting to class. Along with showing vacancies in the rack, waypoints will be able to be inputted into the app to show the user the quickest and fastest route to the desired bike rack. Users can manage their time well by looking on maps, which not only describe the vacancies of the bike racks their their classes, but the relative bike traffic in these areas. This allows a user to planning their travel times easily, which is more time efficient and less stressful. Finally, users of the SmartRack mobile app will be
able to have peace of mind in knowing that their property (bike) is always safe and monitored. The sensors that determine bike rack vacancies can also decipher what time bikes are removed from the bike rack, and the SmartRack mobile app will have the ability to send a push notification to a user if this activity does not align with their preconceived timeline.

The SmartRack is a very simple idea that can make the lives of all users a lot easier and keeps their property safer. Depending on the opinions of the developing team\(^1\), there are also several different technologies that could possibly be utilized in order to fulfill the aforementioned product functions. The use of multiple sensors, cameras, or even some sort of check-in method with labeled bike parking spaces are all possible features that will be considered to ensure that the SmartRack has a user-centered design. A university campus is the best place to introduce this technology because there will always be users eager to find the quickest and easiest route to class.

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\(^1\) See the Development section of the proposal for more information
Section 3: Value Proposition

Obviously, Smart Rack is a very intriguing product, but what is it about Smart Rack that would attract consumers? This value proposition can be best explained through two key concepts: security and time efficiency. As previously stated, bike theft is the number one crime on campus at the University of Arizona. Moreover, many students use their bikes while on campus. The core concept behind Smart Trek would add a security feature to what was once a standard bike rack. To our knowledge, there is no other type of bike rack that has this type of technology on college campuses. With this type of innovative technology, Smart Trek allows students to have peace of mind knowing that there is something else that can monitor their bike and potentially deter a thief from stealing it while they are in class or not in physical proximity with their bike.

Students certainly see the value proposition in the Smart Rack app in terms of security, but this app also has value specifically to the University of Arizona. UAPD consistently has to deal with many cases of bike theft and they have no data other than the individual’s story. Often, bike theft is hard to track because the bike is long gone before the victim has a chance to notice. Now with Smart Rack students have information that they can relay to the police, such as the location of the bike rack and an associated time stamp that the user receives through a notification. Furthermore, simply installing these sensors would deter a certain amount of crime, as thieves will be aware that technology is monitoring bike removal. The university in turn can reduce bike theft by supporting the app.
The second part of the value proposition of the Smart Rack app is the idea of time efficiency. As previously stated, the app would have a portion that tells students how many open spaces are available on a particular rack. The motion sensor technology on the bike racks mentioned previously would make this possible. Moreover, a map would be available to students to show what areas or routes are congested on campus. So often students bike to a crowded or large class only to find many bike racks completely filled. Consequently, they have to search around for a few minutes to find a spot. This can make a student late to class. Smart Rack would help students in avoiding this hassle and this can prove to be incredibly valuable for most students.

Similar to security, the benefits of time efficiency apply to the University of Arizona as much as they do to students. The university will be able to reduce its congested areas on campus. The result of this is a safer environment for its students with less hazards and less potential for collisions. Also, this sort of technology is already present within a setting like Google Maps; however, in a form of repositioning it could be utilized for the Smart Rack app, giving it a new value proposition. Overall, Smart Rack has a unique two sided value proposition that makes it attractive to both the users of the app and the University of Arizona.
Section 4: Benefits to Consumers

As a result of SmartRack and its functional applications, there are only benefits to be gleaned from the product’s implementation on the University of Arizona campus among that of other universities and colleges. The target consumers for this product are those who ride frequently ride their bikes on campus, including but not limited to students and faculty. In particular, it ought to be noted that the rate of bicycle theft on campus is bound to drop as a result of criminal realization of the SmartRack’s capacity to alert students via a mobile application push notification upon the unwarranted removal of their bicycle, or other locked and non-motorized vehicle occupying a position on the SmartRack. Just as in other scenario-based circumstances, recognition of the SmartRack’s functionality in increasing ease or difficulty of bicycle theft will act as an automatic deterrent to the crime. By reducing the rate of such crimes along, the individual (operators of non-motorized vehicles such as bicycles in this case) would benefit through retention of property, and the University of Arizona or other college campus community would further make gains through augmented safety. Through these simple avenues, it is already apparent that both the individual (normatively students or faculty) and surrounding community as a whole derive advantages from SmartRack application to campus.

Where convenience is further concerned, the SmartRack yields additional benefits since individuals will no longer need to waste time or effort on apprehension in finding an open parking spot for their bicycle or other nonmotorized vehicle. This is an advantage specifically afforded by the SmartRack’s integrated sensors, which are
wireless and communicate with the SmartRack mobile application in order to proliferate information to the individual user regarding the location of SmartRacks that have yet to reach their maximum capacity for locked non-motorized vehicles. Much convenience will be added in terms of the ease and speed of individual knowledge regarding real-time occupancy of the SmartRacks; as a direct result of this, individuals will be able to plan accordingly and travel directly to an available SmartRack, park their non-motorized vehicle more quickly, and thereby minimize general commute time while enhancing student punctuality.

Along the same vein of convenience and commute time mitigation, operators of bicycles or other nonmotorized vehicles will be able to register their vehicle with the SmartRack mobile application, and on university or college campuses with a widely proliferated WiFi, 4G LTE, or other Internet network available, SmartRack will offer a map component which highlights routes across the campus and the degree of traffic congestion along each route. By virtue of such a technologically-wired mobile application component, individual users will also be provided with the opportunity to verify the most and least congested travel routes at a glance and in real time. In this way specifically, the individual user of SmartRack, including students and faculty, among other community members on a national scale, who travel through or work on a college campus will be more adequately equipped to handle potential vehicle theft or inconveniences of commute. The community as a whole will then extract additional benefit at large from the overall augmented safety of the area and mitigated obstacle of traffic congestion. These two generic parties--the individual user and the
community--are those most impacted by the SmartRack implementation’s wide range of advantages.
Section 5: Development

As mentioned, SmartRack is an application that will be marketed specifically for college students who use bicycles to travel on campus, and therefore the team in charge of developing this mobile application should be closely associated with the University of Arizona in order to better understand the needs of the consumer. For this reason, the ideal designers for developing the SmartRack application from these prototypes are, in fact, University of Arizona students themselves. A business proposal will be pitched to several different departments including the Department of Computer Science, the College of Engineering, and, of course, the Eller College of Management. The current plan is to have team members from each department, with engineers and computer science majors developing the technology while Eller students work on marketing and management. Applicants will be chosen to work on the SmartRack mobile application based on an interview process, wherein qualifications and credentials will be considered in order to build the most innovative and trained team possible. The students who are hired by SmartRack will gain valuable work experience, and will be responsible for developing the sensor technology to be used in the bike racks and the best design for the mobile application. As an added benefit, the students who are hired by SmartRack will not exhaust the start-up capital required in the development phase of this product, as they will undoubtedly work for less money than a professional designer would.

The strategy of using a team of University of Arizona students to develop the technology for SmartRack is both feasible and universally beneficial, as it promotes the
development of the product while it advances the reputation of the university. Mobile Matters\textsuperscript{2} is a campus-wide association of students, teachers, and professionals that work to augment innovations in mobile development at the University of Arizona. Depending on the stature of the team, Mobile Matters is able to directly publish new mobile apps or to present them in a student showcase. This community of leaders exemplifies the technological innovation that this university endorses, and would surely be a valuable resource in the development of this product. Furthermore, if a largely student-run team is successful in developing the SmartRack technology and subsequently publishing this mobile app, this would improve the technological and educational reputation of the University of Arizona. Although SmartRack is a product marketed specifically towards University of Arizona students, the development of successful and valuable technology could inevitably spread for use in different campuses across the nation.

\textsuperscript{2} Reference: Visit \url{http://mobilematters.arizona.edu/about-us} for more information
Section 6: End Goals and Conclusion

With the demand for a product to decrease bike theft on this campus being so high, the implementation of the SmartRack is crucial. Being able to place a University of Arizona label on it when advertising it to other universities, the city of Tucson, or even nationwide would increase the reputation of Eller and decrease bike theft significantly. With the progress into the digital age, incorporating the smartphone application as a tool to track the bike would be very popular. This could be introduced at registration, orientation, or any tours of campus to notify people of this new piece of technology. We believe this would be a big hit. Registering your bike with the system would be quick and easy and would allow peace of mind when you park your bike on campus. After finding out that the most popular spots on campus (Rec center and Union) also have the highest theft rates, the navigational feature allowing access to unused rack space would assist with that increased rate of theft. Being able to search within the app and find a bike rack that may not be as popular or as crowded would allow for proper locking of the bike. The tool that would allow for swift access around campus by determining which routes are congested would prevent potential collisions and damage to someone or their bike. Overall, this unique tool would be beneficial to everyone on campus and the ease of access would popularize this SmartRack app among incoming students very quickly.