WORCESTER POLYTECHNIC INSTITUTE

# Sustainability of a Worcester Indoor Track

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Running during the winter months in Worcester can be very dangerous; the streets are often icy and slick. Our goal was to design a model for an indoor athletic facility that was self-sustaining and that faculty and students could use for practice when weather conditions were unfavorable. We found that a facility housing a fitness center and an indoor turf field as well as an indoor track could generate enough revenue to be self-sustaining.

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# Introduction

The purpose of our project was to design a business model for a self-sustaining indoor track and athletic facility that could be utilized by WPI and local athletes. Winter weather conditions such as snow and ice, specifically black ice, make training outdoors very dangerous. An indoor track allows for numerous benefits besides insuring the safety of athletes during winter, such as providing a better training facility during foul weather conditions. Using online calculators, we estimated the construction and maintenance costs of various models. These calculations were supplemented by interviews with managers from several local indoor tracks providing insight into the design, construction, and maintenance of these facilities. In order to build and maintain a more economically sound investment for WPI, we put together several proposals to move toward a self-sustaining facility, such as: a fitness center with several membership packages, renting the track out for meets and other events, as well as having an infield that converts into an indoor turf field, which would also be rented out. Our final determination for the facility is that in order for it to be self-sustaining it would have to include both the fitness center and indoor turf field alongside the indoor track in order to generate enough revenue to maintain the facility. A build of this design would cost approximately $12 million to construct.

# Background

## Need for and Benefits of an Indoor Track

Track athletes at WPI currently have no indoor track to practice on during the winter. They do track workouts on the outdoor track when possible, but very often this cannot happen

due to snow and ice. Even when it is possible, the conditions of running a hard workout in temperatures well below freezing can lead to injuries, and it becomes difficult for the athletes to work as hard as they would if they had access to indoor facilities. When it is impossible to use the track, on the other hand, workouts need to be done on the WPI quad or on nearby roads, which can be dangerous in the winter when the roads are slippery.

With the addition of the small jogging track in WPI's upcoming indoor athletic facility, WPI athletes may have a safe place to do a slower run when the conditions on the roads are not favorable, however this option will likely not, provide an adequate place to do any regular track workouts. Currently, the only place to do a workout indoors at WPI is the small track in Alumni Gymnasium, but that is too small and oddly shaped to be used frequently, increases the chance of injury.

With the exception of Holy Cross, there is not a college in the city of Worcester that has access to a complete indoor facility. All of the colleges as well as the high schools would benefit greatly from having a central place to practice during the winter.

A full indoor track facility will not only provide runners from WPI and other schools with a safe way to practice during the winter, but it will also allow the other track athletes such as the pole vaulters, who currently use Holy Cross's facilities for their regular training, a place to practice. With the possible addition of turf to the facility, many other sports teams could also make use of it during the times of year when practices outside are difficult.

This would allow school to host track meets during the indoor season, since there is no competition quality facility in Worcester for WPI or any of the other schools. Schools in Worcester generally need to travel by bus for at least an hour every week to participate in a

track meet. With a local facility, this travel time is drastically reduced. This also provides WPI with the opportunity to host its own meets during the indoor season.

## Model Athletic Facilities

To design an Indoor Athletic Facility for the city of Worcester we needed to look at other successful athletic facilities. We looked at the Reggie Lewis Center in Roxbury, Massachusetts and interviewed Steven Keys, the Center's Operations Coordinator. We visited Springfield College's new Field House in Springfield Massachusetts and spoke to their Director of Recreation, David Hall. We also visited Smith College's indoor track in Northampton, Massachusetts; as well as speaking with our athletic director Dana Harmon about WPI's own planned athletic facility. Other athletic facilities used as references were the Auburn Sportsplex in Auburn, Massachusetts, the Naval Academy's Wesley Brown Field House in Annapolis, Maryland, and the Sam Boyd Stadium at University of Nevada, Las Vegas. The following describes each facility and its purpose for its inclusion in this report.

The Reggie Lewis Center opened in 1995 and became a central part of the Roxbury community (1). It provides a place for the community's residents to exercise, a high school track for teams from Boston to practice on, and a center for the students of the Roxbury community college to work out and stay in shape. The center offers a variety of programs for the community's residents, including, but not limited to, personally designed fitness programs, aerobics classes, tennis, volleyball, basketball, African jazz dance workshops, and a cardio-walking program for senior citizens (1). Along with being a contributing member of the community, the facility hosts the Boston Indoor Games and Nike Indoor Nationals. These large

track events make the Reggie Lewis center one of the premier indoor tracks on the east coast, and home to some very impressive facility records.

The Reggie Lewis Center is strongly affiliated with Roxbury Community College. Based on an interview with Steven Keys, the Reggie Lewis Center's Operations Coordinator, we were told that many students from the college fulfill their work-studies by working at the center. Roxbury's students are allowed access to the facility's gym equipment and indoor track. In addition, he told us that Boston Public schools also use the track; paying a rental fee for full use of the track for a few hours after school. In addition, the center also rents out the track on Fridays and weekends to various organizations to host track meets. Mr. Keys told us that the track does bring in money to support itself, and having work studies from the college helps to lower expenses, but the facility does still receive aid from the City of Boston. In addition to the benefit the indoor track provides to the community, Mr. Keys said that programs for seniors citizens that also have a very positive impact on the community.

Ideally, we would like to have a facility here in Worcester structured very similarly to the Reggie Lewis Center. A center that was strongly affiliated with WPI, providing our students and athletes a place to run and practice in the winter months without fear of being struck by a car, as well as giving back the community and bringing recognition to Worcester and WPI; however, the indoor facility needs to be more independent and self-sustaining than the Reggie Lewis Center in order for our model to be considered.

Springfield College is one of WPI's competitors in NEWMAC, but this year in track they have surpassed us in overall D3 rankings (2); this is largely due to their new athletic facility, which contains a new weight room, cardio center, and indoor track. In our interview with David Hall,

Director of Recreation, we were told that the construction cost of the new facility was about $22 million, or $120 per square foot; this information served as a baseline for to help predict the cost for our model facility. Mr. Hall described the buildings as a metal shell with some insulation between the interior and exterior metal shells. This description allowed us to determine possible materials for construction; which allowed us to estimate our building heat loss. Unlike our model, Springfield's indoor facility is only for college use, and they run the facility at a net loss of money, according to Mr. Hall. This may work for Springfield because they have a strong emphasis on athletics, however it does not make much sense for our facility. Despite the fact the facility is only for college use, Mr. Hall told us that the center receives as many as 1,500 individuals exercising per month. Scaling the total population of Springfield College to match WPI's total population gives a general idea of the total use expected in a facility of this design by WPI, not taking into account other colleges and the community at large. Modeling a facility after their new indoor track could not only give us a design that is easy to construct and is functional, but also an indoor track that would give WPI a more competitive edge in track and other sports.

WPI plans to construct a new indoor recreation facility on campus. We spoke with Dana Harmon, WPI's Athletic Director, to gain a better understanding of what this new facility will bring to the campus. She said in the interview that the contents of the facility are still under debate, but the footprint of the building has been agreed upon, and the intention is to have construction of the building underway by spring 2010. According to Harmon, it is probable that the new athletic facility will at least include a new weight room, a new swimming pool, a large arena-like room usable for robotics competitions as well as career fairs, multiple small

basketball courts connected together composed of half inch mondo flooring, and an indoor jogging track. Harmon said that the track's straightaways should be long enough to do a few sprint or hurdle workouts on, but the track itself, while the exact length at this moment is unknown, will be far shorter than a NCAA regulation 200-meter track. In addition, the track will likely only have three lanes as opposed to the regulation six lanes, and will have corners rather than rounded turns. In short, the new Athletic Facility would only provide adequate space for a few of track team members to work out and conduct practices such as short sprinters and jumpers, despite the fact that WPI is investing $40 million into this new building; it will offer little more accommodations than Harrington did for track athletes.

The Naval Academy Wesley Brown Field House is the most expensive of the model facilities we looked at, costing $45 million (3). This track is truly unique; it has hydraulic banking and a retractable turf field, making it one of the most versatile field houses on the east coast (4). It is able to cater to the many different Division 1 sports at the Naval Academy, especially track and arena football. The hydraulic banking allows the banks of the track to be raised or lowered, so that the retractable turf field can be rolled out, which only takes six hours (4). We have since ruled out banking for our proposed facility due to cost and functionality. What we are truly interested in is the turf field. A turf field is a very appealing option for an infield. It would allow for a multipurpose facility and also bring in extra revenue from rentals. The Naval Academy does not rent out their facility and it is purely for student use, but the new field house is far more self-sustaining. By using the idea of a retractable turf field, we would be able to market the facility in niche areas, generating the revenue necessary to sustain the facility.

Smith College, located in Northampton, Massachusetts, has a quality athletic facility that has hosted several NCAA championship meets and annually hosts the Tartan invitational meet. This track is important because of its general layout and organization, and as with Springfield's track, we were able to see it firsthand. Creating a model indoor facility with a smart and fluid layout is important in designing our model. The track has netting and tennis courts on the infield, which is an option we are considering for the infield of our model facility.

The Auburn Sportsplex is located just outside of Worcester in Auburn, Massachusetts. Upon visiting the facility, we noticed it was constructed from a plastic Quonset hut material that encases a large turf field. The Astroturf field is used year round for soccer clinics and various other indoor sports. They charge a minimum of fifty dollars an hour for their smallest available portion of turf (5). This facility is important to us because of the possibility that we may incorporate a turf infield into our indoor track model similar to the design at the Naval Academy Wesley Brown Field House. The Auburn Sportsplex served as a great example to a revenue estimate as well as a marketable feature for our facility

Lastly, we looked at the Sam Boyd Stadium of the University of Nevada; Las Vegas. This massive stadium does not have a track but rather a retractable turf field similar to that of the one at the Naval Academy (6). The large roll-out official turf (magic carpet) was simply rolled onto the field; it was installed in 1985 for $1.2 million and was in place until 1999 when it was replaced with real grass (6). This is crucial to our model because they installed the retractable turf after the construction of the stadium and it provides us with a price range for the cost of a retractable turf field. The Naval Academy Wesley Brown Field House was built with one flat cost so we were unable to discern how much their turf field cost. Since the size of a football stadium

is the same size as an entire indoor track, we can use their cost of $1.2 million to estimate the cost of what a retractable turf field would cost us (6).

## Design for Indoor Track

To determine the size of the facility's footprint we laid out a basic design of the track. The track will have six lanes that run the full track length with two additional sprinting lanes in the 55 meter straightaway. The throws, pole vault, long, high, and triple jumps will all be in the infield. There is also space allowed for housing the rolled up Astroturf when it is not in use. The exact layout of the interior may not be decided until construction has begun, so we needed to choose a footprint for the building that would also allow for other rooms, such as locker rooms and bathrooms.

To accommodate a competition size indoor track, we figured a rough estimation of the minimum amount of space necessary for auxiliary rooms, such as locker rooms, bathrooms, and a manager's office, to be 100x80 meters, or about 85,000 square feet. The track itself must be 100x60 meters, or 65,000 square feet, in order to meet NCAA standards. The extra 20,000 square feet to accommodate the auxiliary rooms is purely an estimation, but is essential for the facility to be self-sustaining.

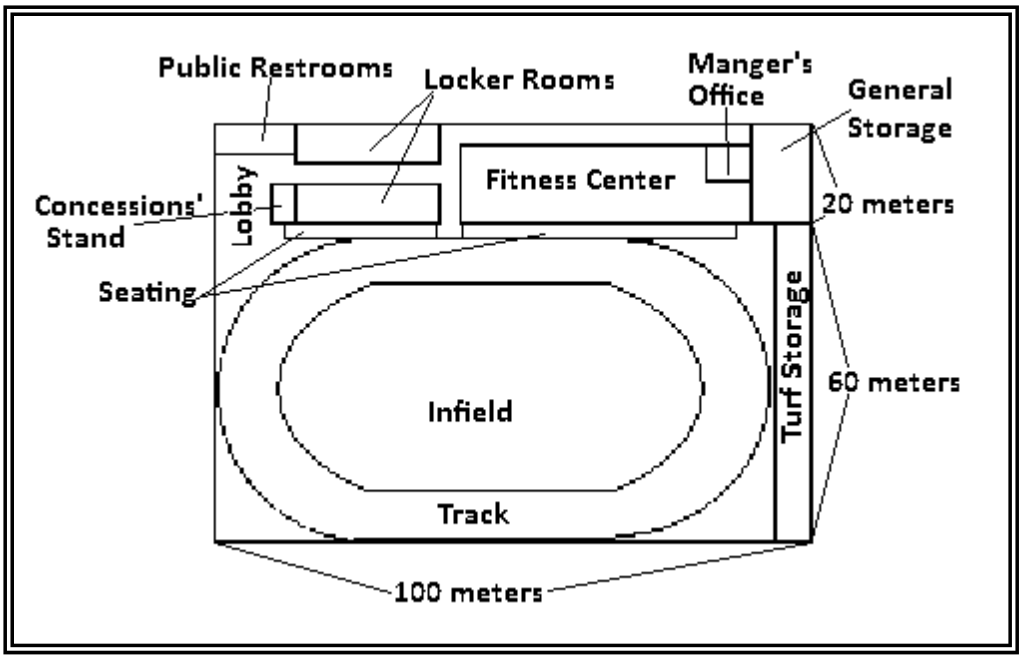


**Figure 1: Lay of Purposed Athletic Facility**; this is a basic lay of the indoor track, the infield provides enough room for the field event such as the jumps and throws.

## Planning and Costs

### Construction Cost

Based on an interview with Springfield College's Director of Recreation David Hall, we determined the facility itself would cost about $10,320,000. This is based on the estimate given to us by David Hall of $120 per square foot, and is not an unreasonable estimate taking into consideration that our new field house will cost approximately$250 per square foot.

The addition of a weight room, which we had included in our original footprint calculations, would not increase the construction costs. Taking that into consideration, a well-equipped weight room with cardio, free weights, and weight machines can be outfitted for less than $30,000 according to equipment prices listed for typical commercial gym equipment across various websites such as USA Fitness Direct (7).

Turf, which costs on average $3 per square foot, would mean a base cost of $195,000 for our needs (65,000 square foot area) (8). Making it retractable would raise the price substantially; the University of Nevada, Las Vegas installed an outdoor retractable turf for $1.2 million (9). A football field is roughly the same size as our proposed indoor track area and therefore$1.2 million is a fairly accurate estimation for cost and installation of a retractable turf field.

In total we predict the cost of construction will be 11,530,000 dollars. This includes both the gym and the retractable turf field. To be on the safe side we project a total construction cost at $12 million to allow for inflation and other considerations WPI planners may see fit to add into the final product.

## Heating Costs

Determining heating costs of different buildings cannot be precisely calculated, as many assumptions need to be made in order to calculate the costs. Using different online calculators, we were able to determine the degree-days (10) and R-values (11) for the various models. We believe that our assumptions are reasonably accurate and provide the most precise costs as possible without having a definite design to work with. The first few assumptions we had to make dealt with the structure itself. We had to consider the number of windows throughout the building as windows lead to heat loss. We then had to consider the efficiency of the insulation of the ceiling, walls and floors. We decided on using certain factors which are attached in our calculations.

In order to use a heating cost calculator we had to assume the average temperature outside the building. We chose a temperature of 66 degrees as our average. We then estimated

the average price of fuel to be $2.00/gal. Finally we had to determine different levels of occupancy to determine the air change rate. Using all of these factors we were able to plug them into a heating cost calculator and came up with costs for each level of occupancy at a temperature of 66 degrees. We took an average of the prices per occupancy level and came up with an average heating cost per year.

One model we considered for our indoor track was the transformation of a supermarket or shopping center into an indoor track facility, however, without an exact building to reference for the final product; it became necessary to make several general assumptions about a building of this type, including: no windows in the building, since many markets have very few windows and in comparison to the overall size of the structure these few windows can be neglected. We also had to assume the coefficients of insulation in R-values the walls, floors, and ceilings, shown in **table 1**. Since many buildings we would be considering for this project were older, we assumed the insulation to be slightly less efficient than what is available today. We also had to assume the building was the same size as any other building we would be comparing with. After determining the costs for each occupancy level we took an average and determined that the average yearly cost to heat an existing supermarket or shopping center would be $108,457.

As with the supermarket, we had to make a few assumptions with a newly built structure. One positive about using a newly built structure is we would know the exact design and heating efficiency, as we would be in control of the design. We determined that our building would have no windows and that the floors, walls, and ceilings would be slightly more heating efficient due to new technologies and required elements. We determined the cost of

heating for each occupancy level and then took the average. We concluded that the average heating cost of a newly built structure with an average outside temperature of 66 degrees would cost $104,963 annually.

In conclusion, we determined that a newly specific built indoor track would be more efficient when dealing with heating costs. Although the difference in costs only differs by about $4000 per year, we are more confident that our assumptions made for a newly built structure accurately depict the cost whereas the shopping center model could differ with each building. So, from a heating cost approach, a newly built building would be recommended.

## Locations

Any locations chosen for the site of the facility would likely be unavailable by the time the project is underway, so rather than containing a list of potential locations, the plan includes the advantages and disadvantages of a number of possible templates for the building.

The possibility of converting an abandoned supermarket into the new facility bore consideration. The biggest issue with this model is finding an old supermarket in a convenient location that is large enough; many currently active supermarkets looked at were a bit under the required dimensions for the new indoor facility. Also, a large number of supermarkets do not have the high ceilings required for events such as the pole vault. The advantage of this model is that little would have to be done in the way of construction compared to the other models.

Another possibility involves converting an abandoned warehouse. As with the supermarket model, this requires finding one with the required dimensions, although most unused warehouses are more likely to meet the minimum dimension requirements than a

supermarket would. Many warehouses have support columns throughout them, which would be in the way of building a track, so major construction would potentially still have to be done in order to remove the necessity of those columns.

Provided a large enough area could be found, a newly constructed facility is another option. This possibility's main advantage is that the facility could be constructed to whatever specifications are decided upon. The main disadvantage is that the cost could be prohibitive compared to converting an already existing building.

## Electric

Another annual expense for any of the models is electricity, broken down into the actual electrical cost and the cost of fixtures.

For the retail model in the most likely configuration, we would use the pre-existing fixtures installed throughout the building. These are classified as commercial grade fluorescents and would cost on average $310,255 per year to power, and cost approximately $4 per bulb, with a lifespan of 20,000 hours.

With a warehouse model, it becomes apparent that a retrofit would be required in order to produce enough light generally accepted for gymnasiums and other competitive indoor athletic facilities, approximately 40 to 60 footcandles (12). The most likely choice for these light fixtures would be metal halide fixtures, which cost approximately two dollars and fifty cents per bulb at 20,000 hours as well. However, with buildings of comparable size, in order to produce comparable coverage, it requires fewer metal halide bulbs compared to fluorescent bulbs. Using N Star’s online calculator for commercial applications, a building of our size using metal halides running for 10 man hours would cost on average $45,333 a year (13).

The new construction would cost approximately the same as the warehouse model, with the assumption that the new construction used metal halides of comparable number. The difference is that there is no retrofit cost, both in new light fixtures, and the very likely possibility that a warehouse within the Worcester area would require a wiring upgrade so as to be within code of its new use. New construction has the option to use alternative power methods such as solar power to offset the cost of electricity.

## Employee costs

When discussing costs with relation to employees, it becomes necessary to examine how the facility would be staffed. At a basic level the building would require a manager to take care of the actual business, and then an assortment of facility support comes into play; janitors and general maintenance. With a bare bones staff, using current salary trends gathered from various job sites, the human aspect of the building costs approximately $11,600 (14). However, the costs can be altered according to how the building is staffed. If supplemented by WPI's facilities staff, the costs would then drop to the cost of a manager's salary which is approximately $50,000 a year. The total manpower of the building need not suffer however, if in the facility work-study students are used for some of the positions that would otherwise be occupied by additional staff. Of course, as the facility is expanded to encompass a turf aspect, and or a gym, the personnel requirement increases.

# Cost of Facility

| | |
|---|---|
| **Average Outdoor Low** | 10 F |
| **Heating Degree Days** | 6600 |

| | Square Feet | | Shopping Center | New Construction: | Warehouse |
|---|---|---|---|---|---|
| **Ceiling** | 91491 | | 7.74 | 10 | 1.2 |
| **Walls** (length) | 10761 | | 8.09 | 12 | 1.28 |
| (width) | 9146.9 | | 8.09 | 12 | 1.28 |
| **Windows** | 2100 | | 2.38 | N/A | 1.1 |
| **Floor** (Slab) | 1213 | | 1.41 | 3 | 1.28 |
| **Volume** (Feet cubed) | 1000000 | | | | |
| | | **air change** | **Cost:** | | |
| **Occupants** | 0 | 0.5 | $ 109,338.00 | $ 105,844.00 | $ 788,272.00 |
| | 30 | 0.5 | $ 94,718.00 | $ 91,224.00 | $ 773,652.00 |
| | 100 | 1 | $ 129,208.00 | $ 125,714.00 | $ 772,502.00 |
| Estimating occupancy breakdown to be: | | **Total Cost:** | $ 108,457.50 | $ 104,963.50 | $ 776,904.50 |
| 25% full, 40% training, 35% "empty" | | note: cost w/ fuel at $2 | | | |

| **Utilities:** | | **New Construction** | **Shopping Center** | **Warehouse** |
|---|---|---|---|---|
| | Heating | $ 104,963.50 | $ 108,457.50 | $ 776,904.50 |
| | Lighting | $ 45,333.00 | $ 45,333.00 | $ 45,333.00 |
| | Staff | $ 116,000.00 | $ 116,000.00 | $ 116,000.00 |
| | **Total:** | $ 266,296.50 | $ 269,790.00 | $ 938,237.00 |

| **Supplies:** | | |
|---|---|---|
| | Light bulbs: 21 | $ 945.00 |
| | Toilet Paper @3.75 | $ 3,750.00 |
| | Water and Sewer | $ 6,953.32 |
| | **Total:** | $ 11,648.32 |
| | **Complete Cost of Up Keep:** | $ 277,944.82 |

| **Cost of Construction** | 8600 sq ft, at 120 sq ft $ |
|---|---|
| | $ 10,320,000.00 |

**Table 1 Cost of Facility**; this table so the cost for our purposed athletic facility, one can see the cost of heating, electric, and staff. Heating as mentioned earlier was determined through heating calculators found online; the R-values are given in the table.

### Mortgage

To construct any large building for a college or other organization, WPI would need to borrow capital for construction which results in mortgage and interest payments. These additional costs can be estimated with various online calculators; we estimated that in a worst-case scenario a $10 million loan would need to be taken out to cover a construction cost of $12 million. Using an online interest calculator, we determined that this loan, repaid over a 50-year period, would cost an additional $32,048,010 in interest and taxes, with 360 monthly payments of $7,779 (15). The calculator itself would not allow entering values over $9,999,999, so we entered $1.2 million from the total value and $1 million for the loan amount and increased the resulting interest and tax amounts by a factor of ten.

An option that would reduce the staggering amount of money a loan would cost is the government's pilot loan and grant program. This government program involves a revolving loan process, where money is loaned out from a pool at a reduced rate, then given to another borrower once it has been repaid. The money is leant to developers of brownfield land in order to develop that land into something usable (16).

## Sustainability

### Infield Possibilities

Many different concepts were considered for the infield of the athletic facility. The infield is a very large section of space that is largely unused unless a meets or another large event is taking place. The infield is a lot of unused space that could be used for other purposes to generate revenue that would support the athletic facility. We looked at many other athletic facilities to determine which option would be the best for our purposes. After careful

consideration and research, we determined that an indoor retractable turf field would generate the most money to support the center.

The infield is a fundamental part of any track whether it is indoors or outdoors. It can simply be defined as the area enclosed by the track (17). In our proposed model for the indoor track, our infield would roughly be about 2,800 square feet. In order to make the facility sustainable and feasible we have to try to get the most out of all of the space we have planned. In addition having an infield that could accommodate another sport other than track and field would open up the market for us making the facility that much more feasible.

Upon our visit to Springfield College, we saw that they have basketball hoops that can be lowered down over the infield, and the infield was painted with the marking of two basketball courts. Springfield College does not rent out their track or infield space; all the meets they hold are run by the college itself, not externally like in our proposed model, where we will rent to the meet hosts. Basketball courts serve their goal of providing a school supported facility that is solely for Springfield College students.

The Naval academy did something truly unique in their new $52 million field house (18; 19). They have a banked track, with hydraulic lifts to raise and lower the banking. Lowering the banking of the track allows them to transform the indoor track into an indoor turf stadium. They are then able to use their new sports facility for not only indoor track sporting events but also for indoor soccer, field hockey, and football (20). Indoor turf field suits their purpose well, they have a strong indoor football program, and they received substantial aid from the federal government to construct this new stadium. Converting the infield into an indoor turf field would suit our goals for an athletic facility very well, allowing to tap into markets that we would

not have appealed to before. Although it is the most expensive of the options, it does promise to raise the most revenue.

Lastly we visited Smith College in Northampton, MA; this all women's liberal arts school has an impressive indoor athletic facility with a nicely maintained indoor track. In their particular infield they have tennis courts, and surrounding the infield is a net that can be lowered down around the courts. This design allows for the track to be used while tennis is played on the infield. The netting prevents tennis balls from fly out and hitting individuals using the track. The nets for the courts are completely removable and do not hinder the use of the infield during a track meet. Being that Northampton is a small town in western Massachusetts there really is not much by way of indoor athletic facilities, while in Worcester the Paxton Sports Center lies just outside the city and boasts tennis only courts.

Overall we looked at incorporating tennis courts, basketball courts, indoor turf, and an ice rink as possibilities for the infield; each option posed both up and downsides. Tennis courts like those at Smith College would be easy to install and maintain without permanent fixtures; they pose no impediment during meets and when teams are practicing out on the track. The main downfall of an indoor tennis courts is the demand for it. Tennis is not a varsity sport here at WPI and there are other local tennis courts in the area we would be competing with directly such as Paxton Sports Center just outside the city. We believe that tennis courts would not provide the revenue needed to support an indoor athletic facility. Basketball courts we also considered a possible option for the infield, like at Springfield College that could be raised up and out of the way during track meets, and would require no alteration to the infield itself other than the marking for a basketball court. Despite the ease and simplicity of the installation

of basketball courts (21), we would again be competing directly with not only local area courts like the YMCA (22), but also with WPI who is constructing basketball courts in the new athletic center. With all the surrounding competition basketballs courts would have little to no pull and not provide us with additional revenue to support the athletic facility. Like basketball we also considered volleyball courts, but these pose the same set of pros and cons as with basketball, and because WPI will shortly begin construction on the new athletic center; it would be a waste of space to put something like that in our purposed design. A retractable indoor turf field would be one of the more expensive options, with an installation cost of around $1.2 million (23), it would more expensive than both tennis and basketball courts. That being said there is a niche market in indoor turf. The only other indoor turf field around is the Auburn Sportsplex, who largely carters to more school age children with indoor clinics for soccer and other sports (2). It would approximately 6 hours to roll out the turf infield according to the Naval Academy; but there are many more possibilities for an indoor turf field than with either tennis or basketball courts, which can only accommodate one group. Turf can provide a place for indoor football, soccer, field hockey, and lacrosse. Lastly we looked into an ice rink, something similar to the DCU center; which boasts an arena that can be converted into an ice rink, basketball court, or just an open arena. Our initial idea was to have the facility function as a track in the winter and an ice rink the in summer. We interviewed with Diane Gaspar, one of the chairpersons of the Wallace figure staking club, which has a role in managing the Wallace Ice area. We learned the rink has trouble maintaining itself, due to the extremely high cost of maintaining an ice rink. On top of that the rink is non functional during the summer months, because it would be impossible to insulate and keep the building cold enough for ice. This was all before the looking

into the components that go into the flooring of an ice rink, with that additional level of complexity; we completely ruled the ice rink out as an option.

After examining all the options, we determined that retractable turf would generate the most money, even though initial costs were substantial and the conversion time would reduce the total revenue generating hours. Regardless, the amount of money it could generate vastly out weights the cons. There is a strong market for indoor turf playing surfaces in the area, not only because the climate restricts outdoor athletic field use for three months out of the year, but also because Worcester is a fairly densely populated area, with many schools and colleges in the area. We believe that we could charge $250 an hour for the entire turf surface; Auburn charges about $50 an hour for a smaller portion of their indoor turf. Allowing for transition time between track and turf and including time for meets, practices, general opened track time we would have the turf opened and rented for six hours a day five days a week, which would generate six thousand dollars a week. Without the inclusion of an indoor turf surface, it would seem unlikely that the facility would be able to support itself. Over the course of one indoor season we estimate that the turf could bring in as much as $156,000. This estimation does not account for possible rental time during the summer months.

## Gym Memberships

When originally asked to design this indoor track we were asked to make the facility sustainable if at all possible. We have come up with many different ideas and approaches to attempt to make this possible. One of the ideas we had was to offer memberships for people to use the gym and track. By purchasing a membership, members would be entitled to use weights, cardio machines, the track and several classes that would be offered. Following in the

design of several local gyms, World's Gym, Bay State Gym and the Reggie Lewis, we decided to offer several different memberships to accommodate different groups at different membership fees (1)**,** (24)**,** and (25). First we created a student membership. This gives the students a discounted rate to a nice new facility. We assumed to have about 500 students taking advantage of this deal. The next group we targeted was the WPI staff and Alumni. This group would be paying more to attain a semester long pass then the students would simply based on the fact that they make much more than full time students do. We decided to assume about 150 memberships from this group. The next group we came up with was the general public interested in using the facilities. We came up with several different payment options for the general public, all of which are more reasonable then going to a regular gym. We assumed our offer would attract about 200 people from the general public. We also came up with discounted rates for senior citizens but did not assume a number to attend the gym for the whole year. We decided to also offer track pass to anyone interested in using the track throughout the winter. After calculating the cost per membership and the number of participants, we concluded that we would earn a little over $100,000 a year just from gym memberships. While this does not make our facility completely self-sustainable, it helps to pay a large percentage of the yearly costs.

## Renting

In order to make the building self-sustaining, it requires renting out time in which the facility is not used solely by WPI; offering it instead to other universities and high schools within the city and within Central Massachusetts, at cost. Based on existing models such as the Reggie Lewis (1) and the Auburn Sportsplex (5), a fee of $200 per hour is a reasonable cost for track

use. If a turf field is placed within the facility, then when renting to other colleges and high schools, $250 per hour takes care of both the facility fee and the time lost with the conversion of the area from a track to a turf and vice versa at the end of the time.

The space also allows for athletic clubs to host events, or businesses to come in and utilize the space, and a fee will be rendered appropriately based on the needs of the event.

## Hosting Meets

In addition to renting the track and turf space out to organizations for practices and events, the owners of the facility could expect to rent out space for the use of track meets. An interview with Steven Keys, the Reggie Lewis Center's Operations Coordinator, shed some light on the best approach to hosting meets. The meets will mostly be held on Saturdays, so the scheduling should not interfere with renting the track out on weekdays. At the regular cost of $200 per hour at an expected 8 hour long meet, each meet will generate an additional $1600. Based on the average competition season for indoor track, we estimated 40 meets to be hosted at the facility every year, creating a total income of $64,000 per year for these events alone. The organization hosting the meet will be responsible for providing officials and other assistance to run the meet.

# Revenue Generated

| **Membership includes the following:** | **Membership Fees:** | | | |
|---|---|---|---|---|
| State of the art 200m indoor track | **MEMBERSHIP TYPE** | **CURRENT RATES** | **MEMBERS** | **REVENUE** |
| Personally-designed Fitness Programs | Full-Time College Student | $50/Semester | 500 | $25,000.00 |
| Weight Training facility | WPI Faculty/Alumni/Staff | $90/Semester | 150 | $26,250.00 |
| Cardiovascular equipment | | $175.00/ Annually | | |
| Aerobics classes | General Membership | $80/3 Months | 200 | $50,000.00 |
| Tennis | | $150/6 Month | | |
| Volleyball | | $250/12 Month | | |
| Basketball | Senior Citizens (65 years and older) | $30/3 Months | | |
| Senior Citizens Program | | $60/6 Months | | |
| | | $120/12 Months | | |
| Locker Room and Showers* | Track Passes | $120/Track Season | **Total Gym** | |
| Note*: Government subsidies with regard to community programs can be | | | **Revenue** | $101,250.00 |
| gathered, however the exact amount is unknown, thus a base amount is displayed | | | | |

| | |
|---|---|
| **Commercial model** | |
| track rental (per hour) | $200.00 |
| weekly (5days 6hrs) | $6,000.00 |
| yearly (26 weeks) | $156,000.00 |
| **Community model** | |
| weekly 5days 3hrs | $3,000.00 |
| yearly (26 weeks) | $78,000.00 |
| **Meets** | |
| Meets 8hrs @200$ per hour | $1,600.00 |
| 40 meets per season | $64,000.00 |
| **Total (Commercial model)** | $220,000.00 |
| **Total (Community model)** | $142,000.00 |
| Turf Rental per hour | $250.00 |
| weekly (5days 3hrs) | $3,750.00 |
| yearly (30 weeks) | $112,500.00 |

| | commercial | community* | somewhere in-between |
|---|---|---|---|
| Indoor Track | $220,000.00 | $142,000.00 | $181,000.00 |
| indoor track/turf | $332,500.00 | $254,500.00 | $293,500.00 |
| indoor track, turf, fitness center | $433,750.00 | $355,750.00 | $394,750.00 |
| track/gym | $321,250.00 | $243,250.00 | $282,250.00 |

**Table 2: Table of Revenue**; this table shows the revenue that could generated with our purposed model, the different plans are shown at the bottom: only the indoor track, a track and turf, a track and fitness center, and all three together.

## Social Impact

When examining the social impact of the building, it is important to remember that the outreach will be felt across a broad spectrum of the community. With that in mind, the facility would serve as a basis for many programs; based both for recreation and community outreach. A fully equipped building (with track, gym and turf) allows for intramural sports, such as indoor soccer and lacrosse and tournaments based around these, run by the facility or by groups renting out the premises. With ample room, the space could also be used for evening fitness classes, such as a martial arts class, similar to the cardio karate offered by the Reggie Lewis Center (1). These programs allow the community to enjoy the space as well as improve WPI's standing within it. The space also allows for after school activities run by the city to have more space than would be possible within a normal school.

Financially, with a more community oriented building there is a loss of revenue generating less hours for the college to rent out. However, subsidies exist, both from the state and federal government to supplement the loss of revenue associated with them.

WPI is involved with numerous outreach programs in the Worcester community, especially the K-12 outreach programs (26). A facility that did as much outreach work as WPI would integrate superbly with the current mission of WPI. That is why we believe providing a significant amount of outreach programs would greatly improve the facility.

Upon the construction of our facility, some positions may need to be filled. During the construction of the facility, many people will be required to physically construct the building. Ideally, the job would be contracted to a local contractor. This would produce approximately 20-25 jobs for local people. After the construction is completed, there would be a few permanent positions in the facility. We would need a manager to run the facility as well as a

maintenance staff. We would require around four to five full time positions as well as some temporary or seasonal jobs.

When the new facility is up and running it would improve the city of Worcester's image. It would be a new community center in a city that could use an image upgrade. It would show that the city is committed to a reconstruction of a once prominent city. The facility would allow local youth to have a safe place to exercise and socialize. It would also give elderly people a place to exercise safely without running the risk of an accident. In all the facility would give the people of the city a safe place to exercise and hold community events.

## Brownfield

The construction of an indoor track would not only bring jobs to the city and increase opportunities for outreach programs; it could also convert brownfield land in Worcester into a productive part of the city. A new facility could contribute to the overall welfare of the city, providing an additional source of revenue for the city through property taxes and raising the status of the city. Brownfield projects have already been approved in Worcester, Ma. A million dollar loan was granted for South Worcester Industrial Park, the park was composed of mainly vacant and abandon buildings, the money would be used to develop the 25-acrea plot for private and public use (27).

When going forward with this project, it may be a good idea to look at brownfield land in Worcester for potential sites (27). The city may grant WPI a pilot loan for building on a location classified as brownfield, which means that it may be normally vacant or in some way undesirable for construction. This pilot loan could assist in the initial cost of building the proposed facility.

# Conclusion

## Feasibility of Models

According to our calculations, we determined that three of our four purposed business models would generate some revenue and be able to support themselves. These models were a track with a fitness center, a track with a turf infield, and a track with a fitness center and a turf infield. Despite the fact that three of the models would generate money on paper, in reality, our calculations are under ideal conditions, that is assuming that the track and turf would be rented during all their available time slots and that the fitness center would have a substantial number of members. In reality, in the first and second year of operation, this is unlikely to happen. So, to be on the safe side, our conclusion is that the best way for the facility to succeed in being sustainable is if it is built with turf and a gym. We believe that if an athletic facility is built that includes a weight room and turf in addition to the track; it would be able to sustain itself and generate some additional revenue while providing community-based programs and activities.

| **Feasibility of Models** | |
|---|---|
| **Track** | $ -96,944.82 |
| -Will not work – huge loss of money | |
| **Track w/ gym** | $ 4,305.18 |
| -Probably will not work – unlikely to make this money due to generous income numbers | |
| **Track w/ turf** | $ 15,555.18 |
| -Probably will not work – unlikely to make this money due to generous income numbers | |
| **Track w/ gym & turf** | $116.805.18 |
| -Could work | |

**Table 3: Feasibility of Models**; this table compares each of the purposed model for the athletic facility, according to our determinations we figure that only the track with a fitness center and turf field will be able to generate enough money to sustain itself.

## Future Implications:

Even if WPI builds the facility that includes the gym and turf, it will take approximately 120 years to recover the cost, assuming an income of about $100,000 annually and an initial construction cost of $12 million. So, while the facility is sustainable, it will require a large sum of money to build in the first place that the school must do without for a long time. As mentioned in the mortgage section including interest, the amount of money required to pay off a loan would be extremely large, to the point of being difficult to manage. Another source of money, possibly from alumni donations, would probably be necessary.

If the initial construction costs can be paid, however, and the facility is built, it will provide WPI athletes, as well as athletes from other schools, with a safe and warm place to practice during the winter months. WPI and other Worcester colleges and high schools would be able to use the new facility to host their own indoor meets, something that was previously impossible for most of the schools. The community based programs that could be set up would benefit the city of Worcester, and people would have a new, full weight room and gym to use.

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