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Developing Springfield: A Mason Square Development

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“Developing Springfield”

A Mason Square Market Development

By:

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I. Mission Statement

The State street corridor of Springfield, MA deemed Mason Square is effectively considered to be a “food desert,” which is defined to be an area where it is difficult to find quality fresh foods that are affordable (USDA 2010). The concluding goal of this research project phase and the recommendation project phase are to develop models for a sustainable full-line supermarket, without a preexisting market anchor. These models are to be designed for the local community and must meet social and economic needs while offering a variety of healthy food options for consumer demand.

II. Project Objectives

The Intermediate Qualifying Project (IQP) is a project where undergraduate students from the Worcester Polytechnic Institute complete interdisciplinary research. Each IQP team consists of several undergraduate students from a variety of majors, and each projects' goals are to conduct pointed research towards a specific problem (WPI 2015). The final deliverables resulting from this project are formal papers and presentations, made available to the projects sponsor and faculty. These projects are generally completed in one term of seven weeks.

The Mason Square supermarket project consists of two IQP teams, one for each term completed in the spring “C” and “D” terms of 2015. This paper is the work of the “C” term students along with the aid of WPI graduate students and Springfield Technical Community College honors students. Our sponsor, DevelopSpringfield, is an organization which seeks to foster urban development to strengthen and improve the city's economy, quality of life needs of the people (DevelopSpringfield 2015).

The organization DevelopSpringfield has asked both “C” and “D” term WPI students to research and analyze supermarket models, and form questions, for a full-line supermarket in the Mason Square area of Springfield, Massachusetts. For the development of the required models there are specific goals that are to be met. Such goals are to include increasing local employment, improving shopping habits, considering ethnical concerns, and to provide the local population with quality fresh foods that are also affordable. All goals aforementioned are to stimulate the local economy and improve the quality of life for the city.

These models and resulting questions will be analyzed in further depth by the phase two (D-Term) team. The result of the second phase of research (D-Term) will yield recommendations for the supermarket's operational model based on the research developed in our first phase.

An initial (Soft) deadline of April 24th is in effect for the organization to submit a grant proposal which will incorporate specific analysis and recommendations resulting from the collective research of the WPI IQP teams. The final deadline is first week of June, to ensure that DevelopSpringfield has sufficient time to submit a revised plan for the supermarket; to obtain the New Market Tax Credits.

III. Acknowledgements

We would like to thank the organization DevelopSpringfield, its President and CEO Jay Minkarah, and Professor Kevin Sweeney for allowing us to be the first of two teams to work on this project. It is our hope that this project leads to the full-line supermarket Springfield deserves.

We would also like to thank our graduate assistants for aiding us with this project; your help has been invaluable. We would also like to thank the Springfield Technical Community College students who collaborated on this project and their professor Diane Sabato for their involvement in this project.

IV. Abstract

The DevelopSpringfield project for developing full-line supermarket models for the Mason Square area of the city is a two term project in collaboration with WPI. The goals of both project phases, where to develop methods and operational models for a sustainable full-line supermarket without the use of a market anchor. Our first team divided the supermarket analysis into five categories or “bundles” that was essential to the development of supermarket models. These categories included physical design, operational models, marketing, energy efficiency, and economic impact. Each bundle was analyzed for feasibility, optimal practices, and phase two’s recommendations. Lastly, our team generated a list of future research needs, which will be answered by the second phase project group.

V. Executive Summary

With the Mason Square area of Springfield lacking full-line supermarkets, its community is in urgent need of a local source of quality fresh foods. The organization *DevelopSpringfield* has acquired parcels of land in the middle of this area, named Mason Square, and has reached out to our IQP team to develop models for a new full-line supermarket. This supermarket will be a destination where the community can go to shop for healthier foods, with a variety of options. The organization had also previously secured new market tax credits to build this proposed 43,000 square foot supermarket, however it was unable to use those tax credits within the designated period. *DevelopSpringfield* will reapply for tax credits once it is able to develop a feasible operational model that is independent from a typical chain market operator.

The requirements were to design full-line supermarket models without a market anchor, yet remain a sustainable and profitable entity that offers quality food while catering to the community’s cultural requirements with additional requests of being a “Green” store. To achieve this, the collective parts of the supermarkets design were bundled and divided amongst group members. These respective bundles include

- Operational Models
- Marketing
- Physical Design
- Energy Efficiency
- Economic Impact

Each bundle was developed in certain detail to illustrate the needs and possibilities for these supermarket models. With this project having two-term duration, the initial project

bundles illustrate the many possible models available to the perspective store, with certain degrees of analysis. Each sub project bundle is to be further analyzed for final market feasibility.

The supermarket's operational model is projected to be one of several available options. Without a traditional operator, the stores operational options include using the IGA contracted distribution and marketing model, a Co-Op model, or being a truly independent store.

Having the options for the operational model laid out, the next task was to consider the physical layout of the store and its surrounding area. Research on the topic of interior layout has yielded a range of possible methods for product placement, (including shelving placement and item placement).

To best suit the models for this proposed store, the proper interior design ideals have been found through research done in the field (Seyed-Mahmoud Aghazadeh, Aloysius and Binu, 2012). According to multiple sources, there exists a system based on basic human psychology that optimizes the placement of shelved goods; based both on relative product placement within the store and shelf level placement. By using the varying placement research, an optimal placement of our market's goods can be derived. (Aloysius and Binu, 2012) state that for a supermarket to be successful the staple goods, products such as dairy and meats, that the store sells should be towards the back to encourage customers to venture into the , center, "impulsive" purchasing section. This "impulse" section, to be utilized properly, should be located in the center of the store and should be the most convenient path to the stores staple goods. The discussion section of this paper illustrates these ideas and displays a hypothetical AutoCAD representation of a general store layout

based on the research and our perception of this potential store; the representations are again presented in appendix E.

Since the original concepts of a Mason Square supermarket rose four years ago, there have been several property acquisitions on the Mason Square lot that is to be utilized in the design of the store. These lots have been taken into consideration for space utilization. The dominant ideas include a small park, or, a modular based storefront in the building that currently exists as a car wash. By building a park the building that exists currently as a car wash would be torn down, therefore leaving the space open. As for the modular store chain, community friendly ideas that have been conceptualized by our team, which fit the local area and may prove to increase the quality of life in the area, include...

- A Credit Union
- Café
- Barber Shop
- Nutritional Supplement Store
- A Second hand store
- Video Game Store
- Mobile phone store (Verizon, AT&T, Sprint)

The presented strip mall options, in detail, are to be explored in phase two research.

The next section of the project was the efficiency and environmental impact of the store itself. Having a store that is both aesthetically pleasing and can boast a green energy rating the Mason Square supermarket may appeal to the local communities. Having models for a store, which operates at higher energy efficiency than the next leading store, will save on

energy expenditures due to the reduction in energy consumption. A variety of potential solutions available for green energy integration are...

- Solar Energy
- Green Houses
- Wind Energy
- Closed Refrigeration Units
- LED lighting
- Water usage efficient restroom equipment

Many of which may lead to large savings in utility expenditure, most notably the closed refrigeration. Also by opting to outfit the supermarket with these technologies many tax credits and other benefits can be obtained, such as SREC credits, and federal solar installation cost reductions (SolarFlair).

Lastly the largest impact this supermarket will make is its economic impact, particularly on the surrounding community. After analyzing the proposed options more questions have arisen in this field than have been answered. Among the most prominent of these questions are...

- How will introducing this market affect the community and surrounding stores?
- Will this make the surrounding area flourish, or could there be some unforeseen side effects?
- How will workforce development and training be offered?
- How many jobs will be generated, and what how is this directly proportional to the community's needs?
- Would an increase in local income reduce city crime rates?

VI. Methodology:

The main objectives of our project group was to gather data pertaining to the Mason Square market's design and implementation, and to produce a cohesive list of feasible ideas which are to be built upon during the second term project. This project used a two-phased approach for developing models for this anchorless supermarket. The first phase project, our group, was oriented around developing the initial model ideas and some of the analysis. The Second project group, D-term, will be focused on further analysis and development of these models for presentation and recommendation to *DevelopSpringfield*.

For this project Jay Minkarah had requested green design ideas for the potential supermarket models, which include either a solar panel array or rooftop greenhouse. Keeping the main objectives in mind, the project was planned using a bundled approach. This bundled approach best suited the needs of this project due to sheer amount of consideration each aspect of a supermarket required; each bundle also had multiple sub-categories. The project categories included the Operational Design, Physical Design, Urban input and marketing, Energy Efficiency, and Economic impact. Each of the project's categories was split between phase one Worcester Polytechnic Institute IQP group members.

The first and foremost goal of this project was to develop sustainable full-line market operational models. The idea of the operational models were first discussed as a team, and then presented to us by our sponsor. Our initial researched was direct toward what operational models, excluding preexisting anchors, there were for a new supermarket. We then looked at which of these models seemed the most feasible for this project. Using the three main operational model types we then looked for pre-existing

industry or community based websites dedicated to each model. Our research was conducted using academic databases such as Business Premier, LexisNexis, Google Scholar and point of sale retail websites.

Data on suppliers was found using similar methods as the operational models. First a broad spectrum of research was done to locate suppliers in New England which are big enough to supply for a full-line supermarket. These local companies (C&S and Bozzuto's) would be the wholesale suppliers that would supply the proposed store with fresh produce and dairy products from the area. Once the two main suppliers were found, we then narrowed our research for more local suppliers.

After the stores potential operational models were laid out, the next sub-project was to research marketing options and formulate questions to gain communal input. The idea of the marketing bundle was developed during the initial project idea compilation. The marketing ideas were researched and identified by identifying what supermarkets currently do and what industry reports say they do. When these ideas were identified our team went on to find research that analyzed different marketing methods used by big name supermarkets.

Having the operational models and marketing laid out the next piece of the puzzle was to develop models for the properties layout, and to justify them with existing material. Specific topics taken into account for this project's goals were the store's layout, lot utilization, logistical equipment, and departments.

The initial design of the physical space began with the layout of the Mason Square grounds. Prior to the start of this project, the organization *DevelopSpringfield* previously had CAD work done to render a potential property layout and the stores external structure,

of which, our team operated using the previously done renditions as a base line for our proposed design. To be noted, however, the organization has since acquired another plot of land where a vacant house resides. With a lot design pre-generated the biggest issue was how to utilize the car wash property. Our models include the employment of one of two main options: Tearing the car wash down for a small park or to use the pre-existing structure to house a small strip mall type shopping center, as suggested by Jay Minkarah during our initial meeting. Possibilities for the ladder option were generated from IQP group members, and the S.T.C.C honor student’s suggestions. The underlying ideas for the modular mall are to be analyzed in phase two of the project.

The interior of the store was designed using marketing research on product placement and store layout. (Aloysius and Binu, 2012)’s research into the topic along with the floor layouts found in local visited stores (Shaw’s, Price Chopper, Price Rite, and Big Y), indicated proper techniques in department location and (Spanjaard 2014) also indicates that supermarket shopping is not as calculated as once thought but is more based on emotion. Using this, the stores model layout as a whole followed the findings from the aforementioned research papers. Some aisles were specifically adapted, such as an isle that carries beer and diapers using the suggestions claimed in (Cheung, Chiu, 1968). Knowing that potential customers are looking for a full-line supermarket experience; the stores layout model was designed with all market specific counters in place, counters such as a Butcher, Fish counter, Bakery, and Deli. A General model of the stores interior was then drafted in AutoCAD, by Autodesk, to aid with visualization of layout and is presented in the Marketing section of this paper.

Our next focus was on the operational and logistical needs of each department. This task specifically entailed generating lists of department specific equipment that will be essential to the operation in this supermarket. To achieve the desired list of materials, each department's daily operations were analyzed for what materials and equipment to use. Lists of equipment can be found in the discussion section and the appendices.

Having completed the focus on the stores build, the client's request for a "green" campus was taken into consideration. The request was initially, for our models, to incorporate either a solar panel system, to be installed and maintained by the same company, or a greenhouse for ascetical purpose and functionality. Following the preliminary research into the green technologies, more options arose that could decrease energy expenditure therefore increasing overall profitability. Solutions that were included consisted of miniature Wind Turbines, Closed-door refrigeration units, LED lighting and Restroom Water flow control. Each green innovation had multiple options and their specifications presented, and are included in the energy efficiency section of this paper.

With the stores potential models in place the next course of action was to ask pointed questions about how this supermarket would inevitably affect the economy. To best understand the impact this store could cause of this community the economic data of the surrounding areas was taken into account. From the data provided, both provided by the organization and further research, more questions than answers arose and are to be explored in phase two research. These questions are presented in the economic impact topic of the discussion section.

VII. Discussion

Operational Models:

Business operations refer to the processes and resources that are used to produce the highest quality goods or services as efficiently as possible (Wiley Brand). In a supermarket's case this means getting food and other goods to the customer as cheaply and efficiently as possible. As a group we have defined three operational models that maybe used by the Mason Square Supermarket for their operations. These operational models include being an IGA-independent, independent, and a Co-op run store. Included with the operational models is research about the two of the biggest distributors in New England (Bozzuto's and C&S Wholesale Grocers) who could help out with the supermarket's operations as well as local suppliers in the area that might be able to help supply.

IGA Operational Model:

The first operational model explored was an IGA-independent run supermarket. IGA, known as the Independent Grocers Alliance, operates as a franchise through stores that are independently operated. This means stores are licensed to use the IGA logo and brand without having to give up the independence of being locally owned and operated. Some of the advantages that IGA will give our store are as follows (Why? IGA Pamphlet):

- **Identity and Image:** This includes interior brand décor, a consumer website, IGA employee appeal, and IGA-branded gift/debit cards. These give the store a brand and an image that the consumers know that they can trust.
- **Marketing and Communications:** This includes different IGA marketing events.

- Private Brand Merchandise: This gives the store the option to sell IGA branded products that are cheaper for the customer.
- Employee Training: IGA has their own online training program known as the Coca-Cola institute which gives the employees consistent training that management is able to keep track of.
- Retail Store Standards: This includes customer feedback programs and IGA's five star assessment program which will help improve the store by giving feedback to the store on how well it is operating.
- Dedicated Trading Partners: IGA opens up the channels for the store to receive their goods from well-known distributors including Bozzuto's and C&S.

All of these different amenities that IGA will supply or lease to the store will make it easier on the owner to operate the store. Some of the more important amenities include private brand merchandise, employee training, and dedicated trading partners. With private brand merchandise the supermarket's customers will be able to have the choice to buy cheaper generic food over the pricier named brand products. This is important because it meets one of the supermarket's goals of selling quality yet affordable products for the local community. The employee training provided by IGA will help the community by educating them on how to work a menial job. However additional employee training might be required for employees that do not have a high school level of education. In this case the supermarket could partner with the S.T.C.C or another local college to provide these employees with a higher level education to perform on the job tasks. By IGA providing the store with dedicated trading channels it eliminates the hassle of having to contact and open up a channel with any of the area's local distributors.

The drawbacks to IGA are the fees and requirements needed to be an IGA branded store. The fee that the store will have to pay is a monthly fee of 4.5 basis points of annualized average weekly sales divided by 12 months, which by IGA's estimates will be between \$179 and \$407 each month coming out to between \$2,148 and \$4,884 annually. Other fees include a \$100 annual fee for the Coca-Cola Institute employee training program and a one-time \$1,800 application fee (Why? IGA). These fees do not sound like too much especially if you include all the benefits of IGA, but could cause some products to be marked up higher to pay for the decreased profit margin.

The IGA also have a set number of requirements that need to be met when running an IGA store. The requirements are as follows (Why? IGA Pamphlet):

- Within 30 days of opening for business as a Licensed IGA Retailer, meet all minimum IGA Standards regarding exterior signing and interior IGA brand décor.
- Use IGA trademarks only in a manner approved by IGA, INC.
- Pay Monthly Dues and Fees when billed.
- Regularly offer for sale in IGA Supermarkets a minimum of 70% of the IGA store brand items made available through the LDC.
- Participate in all IGA marketing events.
- Maintain a Three Star rating or higher on the Five Star Assessment Program.
- Submit average weekly sales data when requested for purpose of dues calculations.
- Use a fully operational front-end scanning system.
- Establish and maintain an e-mail address to receive IGA communications.

It is likely that none of these IGA requirements will hinder any of the store's operations but will most likely cause a performance increase to better meet IGA's expectations. The proposed supermarket should already have an email address, front-end scanning system and weekly sales calculations from the start so none of these will hinder any of the store's operations. One of the logistical ideas presented in the design section, the Wasp system, would perform the weekly sales data compilations for the store, thus decreasing the need for an employee to do this. The only negative requirement is the IGA's requirement of having a minimum of 70% of their store brand in the Mason Square store. This requirement can be considered negative because many citizens of the Mason Square area are looking for a name brand items, like Skippy's peanut butter, not just store generic products.

Phase two research will need to answer multiple questions regarding IGA. Some of those questions being; will the store's consumers regard IGA as a store brand that they can trust? Phase two will also have to look into the IGA requirement of offering for sale a minimum of 70% of goods in the store being IGA store brand items. This is because we do not want the store to offer private label products for sale that will not sell while the name brand for the same products would sell. Are the requirements laid out by IGA tough to meet or will they hinder the store's operations in some way? This is important because the IGA looks like a viable option to team up with due to all of the advantages that they will provide. On the other hand, we do not want the IGA to hinder the store so much that the disadvantages will outweigh the advantages.

Co-op Operational Model

A co-op is usually a for-profit business that is voluntary owned and controlled by its members. Co-ops usually do well in niche markets by supplying the local community with healthy/organic goods that they could not get anywhere else. Nevertheless this means that co-ops buy more from local farms/suppliers than supermarkets do. This also means that co-ops are usually more involved in the local community, and every dollar spent at a co-op has more economic impact in the local community than a dollar spent at a conventional supermarket.

The biggest supporters of a co-op are its members. Members usually have to pay an annual fee and be actively involved in the operations of the business. As a result of this members get a say on how the business is ran by voting for positions on their board. Being a member this entitles the member to certain discounts in the store and a patronage refund if a store does well. An average co-op gets around 6,400 depending upon the market that the co-op is in, and those members usually create 60% of a store’s sales (Co-op Strong Together). The price of membership for a co-op usually depends on the co-op, and how long the membership is for. An annual membership costs around \$150-\$200, while an annual membership paid in installments costs \$10 to \$20 dollars more (How to Start a Coop). People that are more charitable can donate more dollars than the membership minimum to support lower income families’ memberships. Another way a co-op can help their members and finance the store is by getting loans from their members. These loans would have decent interest rates that are higher than the banks. The only downside is that these loans are not secured, and the members would be the last to be repaid if the co-op goes out of business.

As mentioned in the last paragraph a co-op store is ran by a board of trustees that are members of the co-op and voted onto the board by other members. The responsibilities of the trustees is to monitor the co-op's financial statement, making sure the co-op is following its bylaws and regulations, oversee management, and to set long-term goals and plans for the co-op. When electing members to the board make sure that they are trustworthy and accountable to the other members of the co-op.

Next term's group will also need to answer some questions regarding the Co-ops feasibility. Will there be enough willing consumers that would become members in the store? This question is essential to the success of the co-op in Springfield because most of a co-op's income comes from its members through membership fees and sales. Can a co-op this big or not having as selective products survive? This is because most co-ops are a lot smaller compared to the size of our store (13,000 square feet to 44,000 square feet). At the same time most co-ops survive because they are in the niche market of selling locally and/or organic goods which have higher margins.

Independent Model:

The independent model will be just like the IGA model but without the name that IGA will bring to the store. As a result of this the store will have to come up with its own marketing, pricing, employee training, standards, etc. The store will be able to get some help by partnering up with one of the main suppliers either with Bozzuto's or C&S Wholesale Grocers. Both of these suppliers will help provide the store with all of basics that IGA provides but without the name IGA has. Bozzuto's and C&S have their own private

band being Hy-top and Best Yet respectively. Other means that both these companies will supply are pricing strategies, marketing programs, category management, and advertising.

Next term's group will have to answer a ton of questions regarding the independent model. Between C&S and Bozzuto's which supplier supplies the best means to support the grocery store? What are the costs of having to use these services from the supplier if there any at all? What are these costs compared to IGA's? Will the store be able to do any of these means without the help from either of the suppliers or IGA?

Suppliers

As mentioned before there are two main suppliers that our store would use, Bozzuto's and C&S. Bozzuto's delivery trucks would be coming from Cheshire CT which is about an hour away, while C&S trucks would be coming from Keene NH which is around an hour and half away. Both of these suppliers will supply the store with all of the goods needed for each department; the departments being produce, bakery, deli, dairy, frozen, meat, seafood, grocery, health/beauty, and general merchandise. Because of this the only decision now is to determine if the store would want to contact with any local suppliers to supply locally sourced goods for the store. There are plenty of local suppliers in the area, to name a couple there is the All Star Dairy Foods and the Pioneer Valley Growers Association (PVGGA). The All Star Dairy Association will provide our store will local dairy products including milk, cheese, and ice cream as well as baked goods like cakes and bagels. The PVGGA will supply the store with locally grown produce that changes by the month.

Marketing

To keep the store up and running it needs to be able to market itself to the neighborhood and local businesses/colleges. According to Olfa Bouzaabia there are three dimensions that customer's evaluate their shopping experience (Olfa Bouzaabia 2013). The three dimensions are:

- The store's service space and physical environment
- The store's products
- The interaction with the store's personal.

To succeed in these three dimensions the store has to have a layout that makes it easy to find products, have products that are interesting as well as safe and not expired, and also train the store's personal to treat the customers well. To do this the store might have to reach out to the community the store might have to do either a survey or focus group to see how the community feels about the store. When the store is in operation it will have to draw customers from the neighborhood into the store by offering different things like healthy foods, takeout options, beer/wine options, ethnic foods, and community outreach programs. The same could be said to the local business/college people because they could be interested in going to the store once their shift is over.

One way the store will be able to succeed is if it keeps up with consumer trends. These trends will make the store more inviting for the customer and keep the store up to date. Some consumer trends include a more willingness to buy private label products, also at the same time an increase in the buying of all-natural/organic foods (CDFI Fund). This trend will be pretty easy for the store to keep up with because it has already been planned

that the store will be supplied with these kinds of goods. Keeping up with trends will be essential to the success of the store, because if the store does not keep up with the trends than the customer's might think that the store does not care anymore.

A decision that will have to be made by next term's group is; would a survey be better done to see what the community wants in the store before it starts, or would a focus group be better once the store is finish. Some things we know will have to be in the shop regardless of customer opinions based on so that this supermarket can be considered full-line. Some customer opinions that are already known based on other studies, for example based on a paper from Seyed-Mahmoud Aghazadeh, there are five factors consumers look at when choosing a supermarket (Seyed-Mahmoud Aghazadeh, 2005). The five are a good variety and quality of produce, cleanliness of the store, products that are not expired and are marked with an easily accessible expiration date, quality meat, and helpful and polite employees. Of course it is still a good idea to talk to local community members to see if their expectations are different. What can be done is a survey; a survey will show us what the community wants in the store and what they do not need in the store. The problem of a survey though is that if we do not do any of their recommendations than the community might think that we are not listening to them, and not go to the store. A focus group done by the community will give us a first impression of the store before it opens. None of the bigger things will be able to be changed once the focus group does start but some little things will be able to be changed like opening/closing hours or products for sale.

Margins and Pricing

The grocery store industry has one of the smallest margins of any industry making 1.9% (CDFI Fund) on sales. The only way a store can survive on these low margins is by having a high volume of sales, and by leveraging higher margin products (often luxuries or non-essentials) For instance for convenience stores' they have a high gross margin on health and beauty items and candy, with those margins being 52.95% and 51.40% respectively (NPS). The reason why convenience store margins are applicable in this case is because it can be used as a reference point to see which of the gross margins are higher. Even though this store is supposed to be healthy, candy will have to be in stock because of the high margin it brings. So there has to be some kind of trade off, but one thing the store can do is help educate the community that candy is only good once in a while.

Other items that have been looked at that could have high margins are beer/wine, tobacco products, and lottery. With beer/wine it has gross margins of 21% and 28% respectively (NPS). These margins are not that high to have them in the store as high margin items, but they could be used to draw in more customers into the store. The only problem is that there is already a preexisting package store on the same property were the store would be. Looking at tobacco products, cigarettes have a small gross margin of 15% while other tobacco products have a decent gross margin of 31% (NPS). So the profit is there from tobacco products; the problem is that would it look good on the store if it is trying to teach the community about health lifestyles while selling cigarettes? Lastly lottery items will need to be looked into. The good thing about lottery is that the store will not have to buy inventory in it and will get it supplied by the state. Because of this there are no gross margins to it, but the store can earn a commission of around 5% (Colorado Lottery)

depending on the lottery item as well as bonuses for the amount sold. Though as said before with tobacco products, it will not look good on the store if it tries to support a healthy lifestyle while also selling items like beer/wine, tobacco products, and lottery. This might make the store look hypocritical which could impact customer's perceptions of the store.

One way the store could have higher margins and still help the lower income families is by having a pay-it-forward plan. This idea comes from pizza and coffee shops that have this plan where people can buy a cup of coffee for someone who cannot afford a cup of coffee. One way this could be implemented in the store is by our lower income customers having a card where they can swipe and get items that have been bought by other people for lower income families. These items will most likely be limited to staple goods like milk, eggs, and bread.

Pricing of the items will be very important to the store; this is because it has to stay as low as possible while also making a profit. Of course there will be loss leaders in the store which are known as products that the store would be losing money on but gaining potential profit from the customers the products bring in. For a grocery store loss leaders would be staple goods like bread, milk, and eggs. There are different pricing for items that the store could use. One of those being Manufacturer suggested retail pricing (MSRP) this is the price that the suppliers suggest. Another is multiple pricing which is having multiple items for one cost, for example three for a dollar. Whatever the store does for pricing most likely they have to be low cost because the store is in a low income neighborhood, so the citizens will not have that much of a budget for groceries.

Product Layout

Supermarkets of the past have spent years perfecting and analyzing the shopping habits of those who shop at their stores, and have even hired researchers to discern purchase patterns. To best utilize the available 43,000 square foot store layout there was close attention to detail. According to (Aloysius and Binu, 2012) up to one third of transactions are unplanned purchases, and it is most efficient in design to locate the staple goods on opposite ends of the store from one another. (Aloysius and Binu, 2012) also show that increasing the range between staple good sections customers are more likely to notice and purchase goods spontaneously and it is therefore optimal to place general goods such as pet supplies, dry and canned foods, cleaning supplies, and other inedible items in a centralized location.

Taking this information and research into consideration Figure 1 below is a CAD representation of the perceived optimal layout of the Mason Square supermarket was drafted.

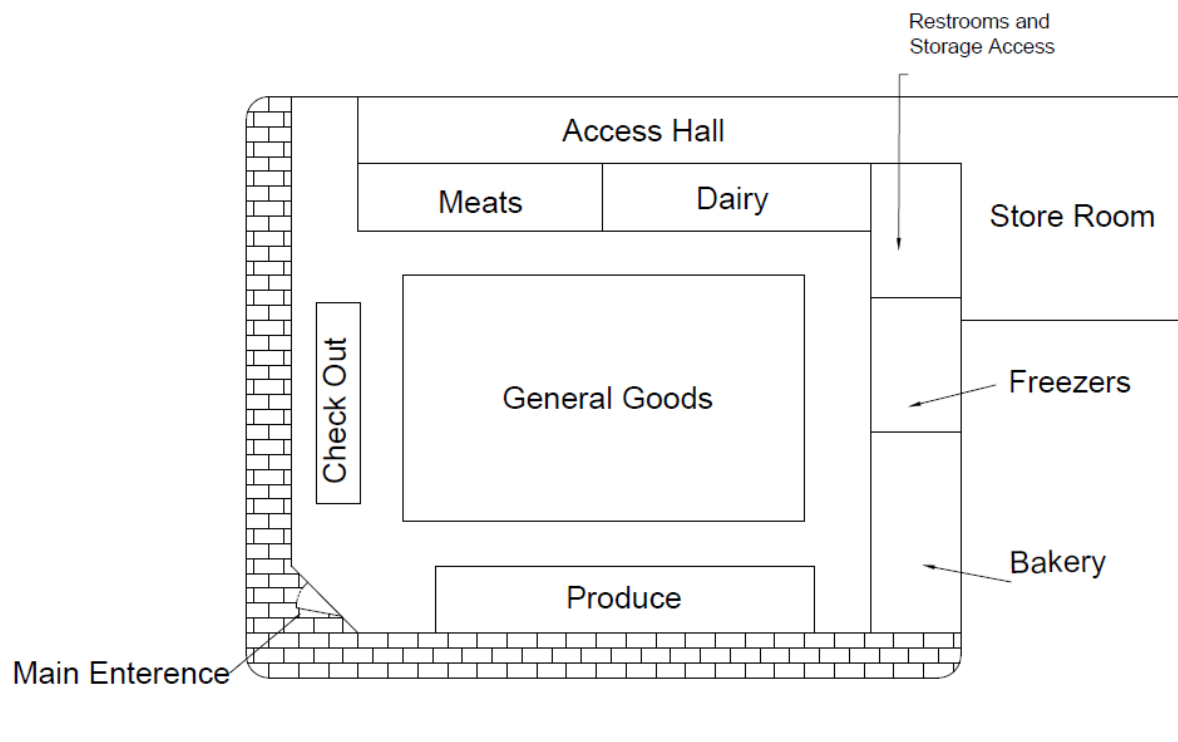


Figure 1: AutoCAD Representation of Hypothetical Layout based on existing renditions

Presentation and layout of our store should make it convenient for the customer as well as make the products accessible and eye-catching. According to (Seyed-Mahmoud Aghazadeh) there are five guidelines on how to properly utilize retail space:

1. Locate the high-draw items around the periphery of the store.
2. Use prominent locations for high-impulse and high-margin items.
3. Distribute what is known in the trade as "power items" to both sides of an aisle and disperse them to increase the viewing of other items. (By power items they mean goods that have high inventory turnovers i.e. milk, white bread and soda)
4. Use end-aisle locations for high exposure rate.
5. Convey the mission of the store by careful selection in the positioning of the lead-off department.

The reason why a store would be laid out this way is to make sure there is a good flow of traffic in the store and to not bunch up crowds of people in one place. That is why power items are dispersed all around the store, so it is not just in one area. Nevertheless if all of the power items were in one area than there would be a crowd of people in that area causing jams in the flow of traffic for consumers. Another reason why all the items are spread out is because of product exposure.

Phase two research will need to answer questions relating to product layout. Questions such as how effective is a product layout like this, and do a lot of stores do a layout like this? This is needed to gain a better perspective on the possible layout and see if it works or not. Is this layout convenient for the customers or does it hinder their shopping experience? Even though this layout is said to be the best way to expose a store's goods it might not be convenient for the customers to have to walk around the store to find their one item.

Mason Square Design Options

Property Design:

The organization *DevelopSpringfield* has since 2011 been trying to introduce a full-line supermarket to the community of the Mason Square area. With little success in finalizing plans which includes the incorporation of a market anchor, the organization has reached out to our team to develop new models for a hypothetical supermarket. The development of new models for the Mason Square supermarket project has initiated the need for further property utilization. Prior to the start of this project the organization had completed some preliminary design concepts of the property and the physical design section of this project was completed using an existing CAD representation as our point of initialization.



Figure 2: CAD representation of the Mason Square Supermarket; Courtesy of *Develop Springfield* and *Doucet & Associates Inc.*

Post initialization of this project in 2011, *DevelopSpringfield* had acquired the local car wash and is currently planning to demolish it to erect a small park, thus joining State Street and the supermarkets lot. The start of this project brought new interest in the car wash property and the possibility was introduced by the president and CEO of Develop Springfield, Jay Minkarah, of converting the car wash into a modular based strip mall. Ideas for this property include proceeding with the initial plans to tear it down for a simple park or keeping the building there and converting the property into a, small, modular based strip mall. Where the strip mall option may bring additional business to the plaza as a whole, the park has the potential to do the same. Listed below are the most prominent and realistic community friendly ideas, which can be commonly found in plazas, like the Lincoln Plaza in Worcester, MA.

- A Credit Union
- Café
- Barber Shop
- Nutritional Supplement Store
- Second hand store
- Video Game Store
- Mobile phone store
- “A Taste of Springfield”: a local market “*Faneuil Hall*” style eatery

Each stores long term feasibility studies will need to be completed, in phase two, to validate the feasibility of each option. Along with these feasibility studies the phase two group is advised to research the potential car wash lot option, “A Taste of Springfield”, where local restaurants will set up, in the vacant car wash building, small stores to sell their foods.

Departments:

One of the requirements for our supermarket models was to be a sustainable full-line supermarket. For this project several local, Worcester MA, supermarkets were visited to gain a specific sense of what departments are commonly offered, these supermarkets included Shaws, Big Y and Price Chopper (West Sloat 2015). The visited full-line grocery stores offered ‘specialty’ departments within the store including a bakery, fish counter, deli and a butcher shop and also offered a ready prepared food section. The collaborating students from the Springfield Technical Community College also expressed an Interest in a prepared food section. To fulfill the full-line aspect of this store, each of these departments were included in the rendering of the potential store, with the Deli, Butcher’s counter and Fish counter being labeled as ‘Meats’. More data is needed to determine the profitability of each department, in a location such as this, and for EBT store requirements for any potential take out area.

Equipment:

To express the operational and logistical needs of the proposed Mason Square supermarket, equipment options for the store as a whole were explored. The explored equipment ranges from the more simple pieces such as the doors of the building all the way to a more complex system such as the inventory tracking systems. Equipment that have been thought have already include

1. Shopping Carts and Baskets
2. Freezers
3. Departmental Specific Equipment

4. Restroom Equipment
5. Pallet Trucks
6. Point of Sale Equipment
7. Mini kiosks
8. Inventory Tracking System

The equipment generally found within the departments of a grocery store has been listed and their specifications listed in the spreadsheets located in appendices A through D. The market feasibility of each item and set of items will need to be performed in the final phase two analysis.

For convenience of customers and staff, mini kiosks are a popular feature among stores. According to Massachusetts state law, items must be clearly labeled with correct prices either using an individual tagging system or a consumer price scanning system must be made available (Ma State Law Section 184C. (A)). *“Section 184C. (a) The correct price of an item offered for sale by a food store or a food department shall be disclosed to consumers in a clear and conspicuous manner. A food store or food department may elect to disclose the correct price using either an individual item pricing system or a consumer price scanner system; provided, that the food store or food department has been granted permission by the division to use a consumer price scanner system. All prices represented to the consumer for the same item shall be consistent with each other and the correct price.”* [5] By offering mini kiosks conveniently located throughout the store, we may reduce the amount of time spent on labeling products, which could then be used performing other various productive tasks.

In visited supermarket environments there generally was a degree of displayed information on available products. Some market anchors, such as one of the visited sites,

use a food rating system to identify what foods are rich in what nutrients (or energy), because of this shoppers can go about their shopping while having a concise display of nutritional facts for the choices they are making. One such nutritional display system, that was found in major supermarket on our visits, was NuVal. “The NuVal System scores food on a scale of 1-100. The higher the NuVal Score, the better the nutrition” (NuVal 2015). By using the NuVal system the proposed Mason Square supermarket, according to the claims of the NuVal system, should be able to inform their customers of a food items nutrition right on the shelving’s price tag. In doing so the consumers will be more informed on what they are purchasing.

Security:

According to the local Springfield statistical maps, made available by City-Data.com, Springfield falls into the high crime rate category. Pictured below is the Mason Square area of the city where the proposed supermarket will be, the coloring of the map along with the city’s crime rating, 527 on city-data’s scale, indicates that it is a mid-High crime rate area.



Figure 3: Crime rate Map for the Mason Square Area (City-Data 2012).

During our initial meeting with the Springfield Technical Community College collaborating students, having a largely popular liquor store and a “Run Down” burger king next door has attracted the attention of habitual loiterers and this has even resulted in physical altercations (Site meeting 1/21/2015). It is therefore a necessity to employ security systems. Several of the ideas produced during this project were purchasing a closed circuit camera system, automatic motion detected lighting, ADT business security solutions, and security personnel. In phase two research, analysis of the optimal security to the premise such as closed circuit camera systems, motion detectors, lockable doors, and security personnel is advised. The prevalent questions for security concerns include

1. If a security service subscription is purchased, will the company be able to cover the whole property?
2. What is the optimal placement of lighting sources to create a safer environment?

3. What is the optimal placement of surveillance for OEM security systems?

Energy Efficiency

Due to the world's environmental issues, it is necessary to account for all of our energy needs and where that energy comes from. For the hypothetical models of the Mason Square supermarket, "Green" technologies as well as simple solutions to cutting back on energy needs have been researched. The EPA has conducted research into the overall energy expenditures of average U.S supermarkets and for an average 46,000 square foot store what they have found is that the annual electricity consumed per year is 2,346,000 kWh (Green Chill 2011). The use of approximately 2.4 million kilowatt hours translates to 3,049,800 pounds of carbon dioxide emissions each year (Green Chill 2011). To cut back on this energy consumption many green energy sources such as solar panels, and wind turbines can be used and there also exist simple methods for saving energy costs, like closed refrigeration units, ecofriendly restroom equipment, LED lighting, and rooftop Greenhouse facilities.

Solar Energy:

The first green energy option requested for this property was the integration of a solar panel array. Having solar technologies powering the store will lead to a reduction in energy, stated above, taken from the power grid therefore reducing the stores carbon footprint and electrical expenditure. Using the data from the EPA and the data from the respective solar companies, along with standalone setups, a comparison was made to illustrate the energy generation capabilities of these arrays. Table 1 below shows price points, power output and the efficiencies of certain panels.

Vendor	Item	Model	Output (watts)	Price (USD)	Efficiency (%)
Amazon.com	Panel	KIT-STARTER-100D-FBA	100	185	15.47*
Amazon.com	Panel	RNG-100D	100	150	15.47*
Amazon.com	Panel	2RNG-250D	250	760	15.3
Amazon.com	Panel	RNG-250D	250	350	15.3
SolarCity	Full System	N/A	Varies	25-100/month	N.A
SolarFlair	Full System	Suntech STP-280	280	Variable	14.4

Table 1: Solar panel efficiencies and pricing points; (SolarFlair) (SolarCity) (Trojan Battery)

(Suntech 2011)

Introducing solar cell technologies in our supermarket’s design requires several data points before purchasing any system. The required data points include Vendor, Installation, Maintenance, and involved costs. As per the request of Jay Minkarah the president and CEO of *DevelopSpringfield*, any solar system should be installed and maintained by the originating company. In the state of Massachusetts there are several brand name companies that install and maintain these units.

Energy expenditures with the addition of solar technologies can be cut immensely, as shown in the case study done by SolarCity for their California Wal-Mart project a 5 - 30% reduction in energy expenditure was achieved (SolarCity, SolarFlair) (See Appendix F).

One popular solar installer company that operates in the United States is the SolarCity Corporation. According to their website they are located in the southwest and northeastern United States and have an office in Agawam, Massachusetts which is one town over from Springfield. SolarCity has worked with big name store brands, such as *Wal-Mart*, *E-Bay*, and *Walgreens* to name a few, and according to their case study for *Wal-Mart*, the

panels installed save 5 to 30 percent of the stores energy consumption (SolarCity Case Study).

The SolarCity Corporation offers businesses three payment options including PPA, where the energy produced is what is paid for, a leasing option where there are fixed monthly payments, and the option to outright purchase the system. According the companies site, general leasing pricing for systems start from 25 to 100 dollars per month for a 3kW system, with an annual increase of from 0 to 2.9 percent (SolarCity). The final audit for the property would need to be evaluated by the Solar City Company.

One considerably large difference between using SolarCity and other services is the incorporation of deep cycle batteries. In traditional solar panel set-ups there are one or more batteries storing the electrical energy produced from the solar array, this energy is then used during times where there is little or no solar output on a location. Because Solar City does not offer a storage system with their panel array, as stated on their website, there would be no power production at night and the store would solely draw it from the electrical grid. Alternate to SolarCity is the company SolarFlair, which provide the same services of auditing, installation and maintenance. The company operates readily in the state of Massachusetts and offers a full range of options. Residential pricing, as a benchmark, is displayed in a pricing table from SolarFlair’s website.

Tiers: Contracted Capacity	1	2	3	4	5
	1kW-25kW	>25kW-50kW	>50kW-100kW	>100kW-200kW	200kW+
Purchased Price (\$W)	\$3.69	\$3.59	\$3.49	\$3.34	\$3.14

Figure 1: SolarFlair Residential Pricing Options (SolarFlair)

Knowing the effective rating of your solar panel array and having a servicer are only the first steps in creating a greener business. In recent years it has become more lucrative for companies and businesses to “Go Green”, with many incentives for doing so. Tax benefits and grants are offered for businesses that seek to innovate. One such federal tax credit that is available to businesses is an innovation credit that covers 30 percent of the installation fees, and has no limit (SolarFlair).

The Solar Renewable Energy Credit (SREC) is also a long-term option for Massachusetts’s inhabitants seeking a payback for using this technology. The SREC is a state wide program for creating environmentally friendly energy, and refunds a certain amount of money based on energy produced (SolarFlair). Each of these credits is generated from producing a mega-watt hours’ worth of electricity, and each credit is worth approximately \$300 USD (Mass.gov). SRECs are then sold back to the electric companies whom are looking to fulfill certain renewable energy mandates. To best utilize the available options further feasibility studies on each company will need to be completed in phase two.

In phase two research, suggested alternatives to the company’s previously mentioned are Cazeault Roofing, Rise engineering, SunRun, Sungevity, and RGS.

Green House:

Having costs involved with importing fresh produce to a region which can become costly particularly in a state which can be extremely cold during the winter therefore lacking an ability to locally produce it (Snyder 2011). During the initial meeting between *DevelopSpringfield* and our team, an alternative suggestion of utilizing the roof space as a

greenhouse facility for fresh produce year around was suggested. According to Snyder, Lufa Farms is a 32,000 square foot rooftop greenhouse that produces fresh produce for customers using a customer supported agriculture model (CSA). In this model customers subscribe for a certain fee each week and receive a proportional basket of fresh produce sized based on the subscribers fee, this model has several tiers of subscriptions (Snyder 2011). However, also according to Snyder the initial costs for building this sized greenhouse was high, priced at 2 million dollars, but states that overall costs of transportation may be reduced for the produce overall.

This idea will need to have a comprehensive analysis done on expenditures vs. profit in phase two research.

Wind Turbines:

A Related and equally as green technology that could be introduced to our store are Wind Turbines. During our project this technology was seen in use within the city of Worcester, at the city’s local Wal-Mart. Their method for incorporating this technology was by introducing small wind turbines atop the lighting posts. The main question is then, how much energy costs can these turbines cover, and is this enough to be considered a good investment? Below are some comparative points on commercially available miniature wind turbines.

Vendor	Retailer	Model	Output (Watts)	Price (USD)	Start up Speed
GudCraft; Aleko	Amazon	WG500	500	435	6mph

Aleko	Newegg	WG500	500	470	8mph
Aleko	Newegg	3KW	3000	1700	3m/s
Sunforce	Amazon	4444	400	485	Not Given
MISOL	Amazon		400	375	2 m/s
Windmax	Amazon	HY400	500	700	Not Given
Nature Power	Home Depot	70701	2000	2500	7 mph

Table 2: Miniature Wind Turbine Data Sheet

To gauge this data national and state wide wind data has been found from the National Renewable Energy Laboratories (NREL 2014) website. For Springfield, Massachusetts the average wind speed is between 4 and 4.5 meters per second (NREL 2014) (See Appendix F). With this average wind speed, each turbine is rated to be able to run on the average day. As with the solar cells, the wind turbines will need to be purchased, installed and maintained by a qualified installer company.

Environmentally Friendly Equipment:

Aside from electrical power generation technology, various forms of energy responsible equipment choices can be made in the design of the store to reduce environmental impact and operation costs, as seen below. These simple solutions include

Closed-door freezers, Restroom Water flow control, and LED lighting. Having these solutions embedded into the design of the store can theoretically lead to large reductions in resource expenditure, as compared to more common less efficient models.

The initial concern for this store was the efficiency of the refrigeration equipment and how much in energy open fridges and freezers waste, therefore increasing unnecessary expenditures. It was found that “simply by fitting doors to the refrigerated display cabinets, savings of 40-55% could be achieved on the energy for cooling” (Ligthart 2007). According to (Ligthart 2007) the payback period for updating existing systems are 2.4 years for chest freezers, and 2.9 years for refrigerator cabinets. Furthermore, (Ligthart 2007) states that having closed displays do not inhibit product sales and that due to the consistent temperatures in the unit the food held within have lower risk of failing inspections as compared to open units. Also shown is that stores with closed door freezers create a more stable ambient room temperature, therefore increasing the stores environment quality. The Mason Square project will be a new market and therefore would, in theory, be purchasing closed door refrigeration equipment initially, which according to the report would have a negative payback period. To illustrate the power requirements and price points on these refrigeration units, comparative tables can be located in appendix D.

Having efficient refrigeration systems can lead to tremendous cut backs on electrical energy expenditure, as proven by (Ligthart 2007). This can intern increase overall profitability for the Mason Square supermarket. By introducing more resource efficient equipment in high usage areas such as the restroom can reduce the amount of water and paper waste significantly. Keeping in mind the potential savings that energy efficient options may induce, each piece of restroom equipment was chosen based on its efficiency.

With already small profit margins, all savings count. The first and foremost piece of restroom equipment analyzed was the toilets. It is becoming a more common practice to use dual-setting toilets to cut back on the production of water waste, as seen in the visited stores and the universities own restrooms. By offering a flow controlled toilet that has a high and low gallon per flush setting, water expenditures will be cut greatly, for the indicated model 0.5 gallons are saved for every low volume flush. For this specific model the Sloan ECOS RESS 8111- 1.6/1.1 automatic flush flow control was used, retailed from Global Industrial, this flow control flusher regulates the amount of water per flush, denoted as gallons per flush (gpf) (Sloan, Global Industrial). The ECOS Ress 8111 has multiple user-friendly controls, which indicate the flow rate resulting from the push by water droplet icons. For this specific model there are two flush settings, the lower flow option is for liquid waste, which uses 1.1 gpf, and a solid waste setting that uses 1.6 gpf (Sloan). For users who only need the liquid waste option 0.5 gpf is saved each use. The toilet receptacle itself (Main body) can cost anywhere from \$120 to \$155, and can be floor or wall mounted (Global Industrial). Examples of wall mounted unit models can be found in appendix C.

While the flow control toilets can be used in each restroom the men's room has the requirement of urinals. Brought to our attention by our graduate research assistant, Sayan Sengupta, was the possibility of using waterless urinals. Waterless urinals are units that work by using cartridges to filter the urine, which is heavier than the sealant within the cartridge which causes this unit to be odorless, and expelling the filtered waste into the swage lines (Sloan). These urinals work by installing a replaceable cartridge in the bottom of the urinal bowl that accepts liquid waste (urine), which isolated from the ambient air by a sealant in the cartridge. The urine then enters the cartridge and is filtered so that some of

the uric sediment is left behind, sediment, which can cause pipe corrosion (Sloan Waterless Cartridge). Due to it requiring no water they do not require any flushing, and are also therefore touch-less. Due to waterless urinals requiring no touch, they are a more sanitary option than the flushed urinal type.

Other restroom equipment such as automatic faucets and soap dispensers have been taken into account for a greener environment not only based on waste expenditure but cleanliness. Several options for this type equipment have been listed in appendix C.

One last green energy innovation that can be integrated into the store is the LED lighting. This form of lighting makes use of Light Emitting Diodes to produce bright light at a fraction of the power costs compared to incandescent and fluorescent light sources. When household incandescent or fluorescent bulbs are used they generally use 60 watts of power but with LED lighting only a fraction of the power is used to power an equivalent brightness bulb. For storefront lighting, where linear bulbs are commonly used, the energy efficient replacement a Philips InstantFit linear unit, which operates at 14.5W, can replace an equivalent 32W fluorescent bulb (Philips 2015). The brightness of this bulb and the lighting effects it produced according to Philips varies based on model and are available to replicate Daylight, Cool White, Brilliant White and Bright White; all of which use the same amount of power (Philips 2015). According to the Philips product site, these bulbs are rated to last between 40,000 and 50,000 hours.

Economic Impact

Building a store of this magnitude in a neighborhood without a full-line grocery store will undoubtedly cause a shift in the local economy. One of our project goals was to better frame the underlining questions, involving the community, which the proposed store would invoke. The following questions pose entire sectors of phase two research, which may lead more refined models in this papers topics.

1. How will introducing this market affect the community?
2. How many jobs can be generated by this markets implementation?
3. What models will exist for workforce development and training, other than the options in the operational section of this paper?

Will there be any negative unforeseen side effects?How would this supermarket affect local crime rates?

VIII. Conclusion

The goals of this project were to utilize research and data collected about each respective field to start the model design process for a full-line supermarket located in the Mason Square area of Springfield Massachusetts. To realize this projects goals our team compartmentalized the individual needs of conceptualizing a supermarket into five sub projects, denoted as bundles, and split them among our two group members based on interest and background. These “bundles” included the topics of Operational Models, Marketing, Physical Designs, Energy Efficient equipment and Economic Impact. Each category’s results are to be further analyzed by the phase two team, and post research models decided upon by the client organization *DevelopSpringfield*. Developing possible operational models, Marketing ideas, Design concepts, Energy efficient equipment, and Economic impact questions for the Mason Square supermarket plaza has yielded many options for operating this store and what will be within it.

The operational models presented by this paper show the prominent three market models analyzed by our team, which include franchising with the I.G.A, adopting a Co-Op model by creatively using a membership model, or being an entirely independent entity. Each option will need to be evaluated further by phase two research for final recommendation to *DevelopSpringfield*.

The marketing aspect of this project looked at the different high margin items, pricing strategies, and product layout methods. These topics discussed different methodologies with which supermarkets increase their net profits and market their goods to increase the store’s profit margin.

Designing operational methods for this supermarket involved both physical design work and logistical needs. By utilizing research on proper product placement and optimal store layout techniques, the models presented offer insight into the ideal methodology for the final representations of the proposed store layout. Also by incorporating the logistical needs into the potential models, the stores operational equipment can be chosen.

To decrease the overall energy expenditures of the store several methods for keeping costs down and creating a “greener” store environment can be utilized. The first method for reducing these expenditures is the incorporation of solar energy systems, solar panels, which are audited, installed and maintained by a single company. The main two companies that offer such a service locally are SolarCity and SolarFlair. By installing such a system there are multiple benefits to be gained such as federal innovation grants, and SREC tax credits. The other energy generation option available is miniature wind turbine, which would require a separate company to install and maintain the system.

As well as the introduction of a greener energy source, this project focused on alternative options to cut back on energy expenditure. One such option was a rooftop greenhouse, by introducing a rooftop greenhouse produce transportation costs can be reduced; and an appealing CSA model can be used to draw customers. The second large expenditure reduction can be made in the stores cooling equipment; by using closed door refrigeration cooling costs can be reduced by up to 55%. Along with the energy saving refrigeration, LED lighting can, depending on model and rating, reduce used electricity.

The last resource expenditure reducing option was water saving equipment used in the restrooms. By using flow control on the toilet flushers significant amounts of water can be saved each flush. Along with the toilets, using waterless urinals in the men’s restroom

would further reduce the amount of water wasted. The last water saving device that can be used in each restroom is automatic faucets, which use a low amount of water therefore further reducing water use.

Economic impact posed questions on how this supermarket would affect the surrounding area both positively and negatively. These questions will be researched by next terms group to make sure that the supermarket positively affects the local community.

IX. Process

During our team’s time on the project there were times where the project was going along smoothly, and there were other times where we hit a bump and lost our momentum. There were also techniques and tricks that we thought worked well and helped us along the project. With this process part of the paper hopefully next term’s group and other groups can use it to help guide them along the project process, and not fall into the same pitfalls that we have had.

Here are some of the pros on working on the project, and some techniques that worked well during the project. The first technique that helped us was that research across the different databases/platforms (Google Scholar, Business Premier) worked well because you were able to at least find one source in each database. Another technique that worked was having our IQP meetings daily worked well because it allowed us to brainstorm problems and to communicate any problems that one of us might have encountered. Having those weekly PQP meetings with next term’s group helped us because they were really responsive and gave us ideas for our project. For example Nate gave James the idea of waterless urinals at a PQP meeting. Being able to work on the parts of the project that we found interesting was great because it allowed a personal interest in the project. For example James found the physical design and energy efficiency bundles interesting, because he is a mechanical engineer and was familiar with the equipment that might be needed. While Nick found the operational model and marketing bundles interesting because he is a management information systems major.

Here are some negative aspects that showed up during the project, that our team thought hindered the projects development. Both of us had a hard time finding material/equipment for the project. For example James spent hours trying to find details about mini kiosks (price checkers), until he had help from the graduate assistant Sayan. Nick had a hard time finding information about totally independent supermarkets since there were not many articles about them. Could have had more help from the STCC students. This seems like it was more of a communication issue because the STCC students' advisor gave us the job to tell the STCC students what to do without telling us. Nevertheless when we did have some work for them it would take a while to get a response from them. All of the snow days this term took a lot of momentum out from this project and made it so that there could not be any scheduling in advance. The project structure was not the best since our group basically started the meeting a week and a half late. During that week and a half there was not anything for us to do until we had our initial meeting with our sponsor. Because of this we had to put a lot of focus into direction and develop those skills. Some things that we originally thought were going to be a big part of the project did not make it into the final paper, i.e. transportation rerouting (not needed because it can be done later). Some of the bundles were so broad that we had many possible ideas, because of this it was rough figuring out what exactly to do and painful when we had to throw some ideas out the window.

Appendix A: Computer Systems

Item	Brand	Vendor	Model/SKU	Specification	Price (USD)
POS Register	ELO	posguys	E518492	15 inch	557
POS Register		JOYFAY.com	JPFOS00016	110V	623.39
POS Register	LOGIC CONTROLS	posglobal.com	SB9011D-J2030-3		695.93
POS Register	ELO	Office Depot	757623	All in one	999.99
Mobile Computer	Skorpio	L-Tron Direct	DL-SKORPIO-6701-902-455-wifi-Gray	wireless	1352.67
Mobile Computer	Kyman	L-Tron Direct	944551005	wireless	1769.38
Mobile Computer	Falcon	L-Tron Direct	X3+	wireless	1700
Labeler	Zebra	Zebra.com	LP2824		225
Labeler	Zebra	Zebra.com	ZT230		999
Labeler	Zebra	Zebra.com	GK420d		425
Labeler	Zebra	Zebra.com	Gx430t		570
Price Scanner	Datalogic	Barcodegiant.com	Magellan 2300 HS	Table Top	655.48
Price Scanner	Datalogic	Barcodegiant.com	Magellan 3300 H S I	Table Top	718.98
Price Scanner	Datalogic	Barcodegiant.com	Magellan 8300	Table Top	738.48
Price Scanner	Datalogic	Barcodegiant.com	Magellan 8400	Table Top	814.37
Price Scanner	Datalogic	Barcodegiant.com	Magellan 8500 xt	Table Top	1474.27
Price Scanner	Datalogic	posglobal	Quickscan QD2400	Hand Held	166.91
Price Scanner	Motorola	Barcodegiant	DS 9208	Mounted	242.24
Micro Kiosk	Motorola	Amazon	MK500-A0U0DB9GWTWR	Imbedded Screen	565.6
Micro Kiosk	WinCE	JM Prime	MK100	Imbedded Screen	
Tracking System	Wasp	waspbarcode		Inventory Tracking	3695

Appendix B: Store Front Equipment Data

Item	Model/Item number/SKU	Brand	Vendor	Note	Price (USD)
Pallet Truck	HP2SL		Global Industrial	5500lb Capacity	249
Pallet Truck		Rough Neck	Northern Tool	4400lb Capacity	199
Pallet Truck	E30	Big Joe	Global Industrial	3000lb Capacity	2999
Pallet Truck	EPT-2547-30-SCL	Vestil	Global Industrial	3000lb Capacity	3669
Pallet Truck	EPT-2796-45	Vestil	Global Industrial	4500lb Capacity	8029
Pricing Gun	Garvey 22-7	Garvey	Store Supply Warehouse	May not be needed	79.95 ea
Pricing Gun Labels	Garvey 22-7 Labels	Garvey	Store Supply Warehouse	Prices Vary based on ordered amount	32.95 - 79.95
Carts	962GSW100	Omco	Webstaurant Store	Child seats and corner guards; 110lb Capacity	96.99
Baskets	962LSB1RD		Webstaurant Store	Available in Green, Blue, Red, and Yellow @ same Price	6.96
Shelving	HA-HWAD3-6013	Allen Display	Allen Display	Wall Unit: 36"L X 13"D X 60"H	131.95
Shelving	HA-HWAD3-6016	Allen Display	Allen Display	Wall Unit: 36"L X 16"D X 60"H	162.95
Shelving	HA-HWAD3-6022	Allen Display	Allen Display	Wall Unit: 36"L X 22"D X 60"H	176.95
Shelving	HA-HE3-5413	Allen Display	Allen Display	End Unit L 36"L X 13"D X 54"H	194.95
Shelving	HA-HE3-5416	Allen Display	Allen Display	End Unit L 36"L X 16"D X 54"H	197.95
Shelving	HA-HE3-5422	Allen Display	Allen Display	End Unit L 36"L X 22"D X 54"H	212.95
Shelving	HA-HE3-6013	Allen Display	Allen Display	End Unit L 36"L X 13"D X 60"H	205.95
Shelving	HA-HE3-6016	Allen	Allen	End Unit L 36"L X 16"D X 60"	212.9

		Display	Display	H	5
Shelving	HA-HE3-6022	Allen Display	Allen Display	End Unit L 36"L X 22"D X 60" H	226.9 5
Shelving	HA-HGST3-5436	Allen Display	Allen Display	Gondola Shelving: Starter: 36"L X 36"D X 54" H	241.9 5
Shelving	HA-HGAD3-5436	Allen Display	Allen Display	Gondola Shelving: Add-on: 36"L X 36"D X 54" H	215.9 5
Shelving	HA-HGST3-5448	Allen Display	Allen Display	Gondola Shelving: Starter: 36"L X 48"D X 54" H	268.9 5
Shelving	HA-HGAD3-5436	Allen Display	Allen Display	Gondola Shelving: Add-on: 36"L X 48"D X 54" H	239.9 5
Shelving	HA-HGAD4-5436	Allen Display	Allen Display	Gondola Shelving: Add-on: 48"L X 36"D X 54" H	215.9 5
Shelving	HA-HGST3-6036	Allen Display	Allen Display	Gondola Shelving: Starter: 36"L X 36"D X 60" H	254.9 5
Shelving	HA-HGAD3-6036	Allen Display	Allen Display	Gondola Shelving: Add-on: 36"L X 36"D X 60" H	228.9 5
Shelving	HA-HGST3-6048	Allen Display	Allen Display	Gondola Shelving: Starter: 36"L X 48" D X 60"H	282.9 5
Shelving	HA-HGAD3-6048	Allen Display	Allen Display	Gondola Shelving: Add-on: 36"L X 48" D X 60"H	252.9 5
Shelving	HA-HGST4-6036	Allen Display	Allen Display	Gondola Shelving: Starter: 48"L X 36"D X 60" H	254.9 5
Shelving	HA-HGAD4-6036	Allen Display	Allen Display	Gondola Shelving: Add-on: 48"L X 36"D X 60" H	228.9 5

Appendix C: Resource Friendly Restroom Equipment Spread Sheet

Brand	Device	Model	Use Data	Price (USD)	Note
Sloan	Flusher	Ecos 1.6/1.1	1.1 gpf or 1.6 gpf	261 - 570	
Sloan	Faucet	ETF-80	0.5 Gpm	375 - 575	
Sloan	Faucet	3326018			
Sloan	Soap Dispenser	SJS-1650	Automatic	126.16	
Sloan	Soap Dispenser	SJS-1058	Manual	12.55	
Sloan	Soap Dispenser	SJS-1058	Automatic	43.99	
Sloan	Faucet/Dispenser Hybrid	ESD-20080-p	Automatic	712	
Sloan	Faucet/Dispenser Hybrid	ESD-25085 CP DC	Automatic	730	
Sloan	Waterless Urinal	WES-5000	N.A	233.55	
Sloan	Waterless Urinal	WES-4000	N.A	253.95	
Sloan	Waterless Urinal	WES-2000	N.A	284.95	
Kohler	Waterless Urinal	K-4918-0	N.A	532.01	
Kohler	Waterless Urinal	K-4918-7	N.A	795.38	
Bobrick	Waterless Urinal	F4000	N.A	210.45	
Zurn	Waterless Urinal	Z5795	N.A	336.95	
American Standard	Waterless Urinal	6154100	N.A	379.44	
Sloan	Waterless U. Cartridge	WES-160	20-pk	741.99	
American Standard	Waterless U. Cartridge	6156	2-pk	60.99	
Trippnt	C/Z - fold duel dispensing	T9FB97848 8	Dispenser (11"X4"X6")	35.5	Global Industrial 16pk. 150sheet/pk
Trippnt	Paper Towels	T9F640300	16pk	24	k
Georgia Pacific	Paper Towel Dispenser (Auto)	59462	Touchless/4 D cells/Hand Wound	111.99	Staples
SofPul	Automatic Touchless Dispenser	GEP58470		62.99	Staples

Appendix D: Refrigeration System Options and Details

Brand	Model	Length (In)	Depth (In)	Height (In)	Power Consumption (Watts)	Temperature (F)	Price (USD)
TRUE	GDM-49- LD	54 1/8	29 7/8	78 5/8	373	33	\$2972.41
TRUE	GDM-69- LD	78 1/8	29 5/8	78 5/8	373 - 560	33	\$3790.96
TRUE	GDM- 33SSL-54- 47	36	18 7/8	54 1/8	897	33	\$2649.58
Turbo Air	TOM-40B	39"	28	78	373	38 - 40	\$5328.58
Turbo Air	TOM- 40M(B)	39	28	60 1/2	373	35 - 41	\$5358.67

Table 1: Closed Refrigerator Data

Brand	Model	Dimension (LXD XH)	Power Req.	Temperature (F)	Price
TRUE	GDM- 43F	(47 1/8) X (29 7/8) X (78 5/8) inches	932 W	-10	\$5,573.79
TRUE	GDM- 49F-LD	(54 1/8) x (29 7/8) x (78 5/8) inches	1120 W	-10	\$5,573.79
TRUE	GDM- 72F-LD	(78 1/8) x (29 7/8) x (78 5/8) inches	1120 W	-10	\$8,049.33

Table 2: Freezer Options and Pricing

Appendix E: CAD representations of Mason Square Store Layout

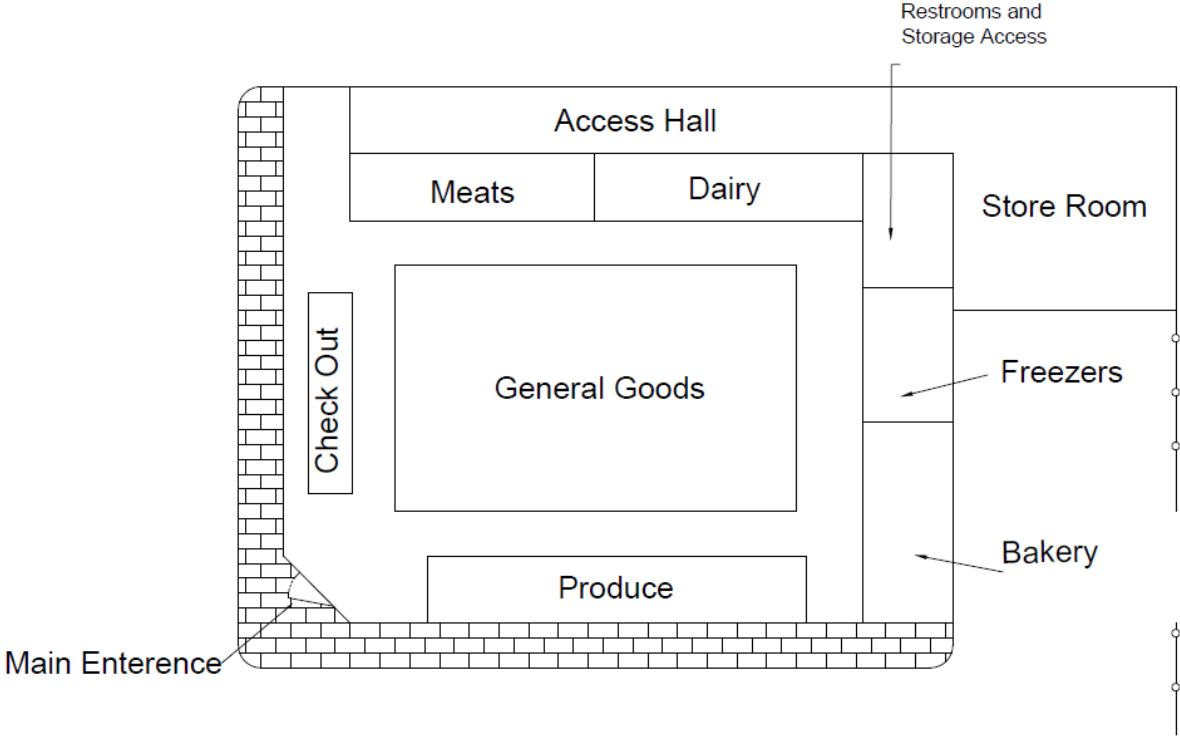


Figure E.1: General Store Layout

Appendix F: Solar and Wind Averages according to NREL

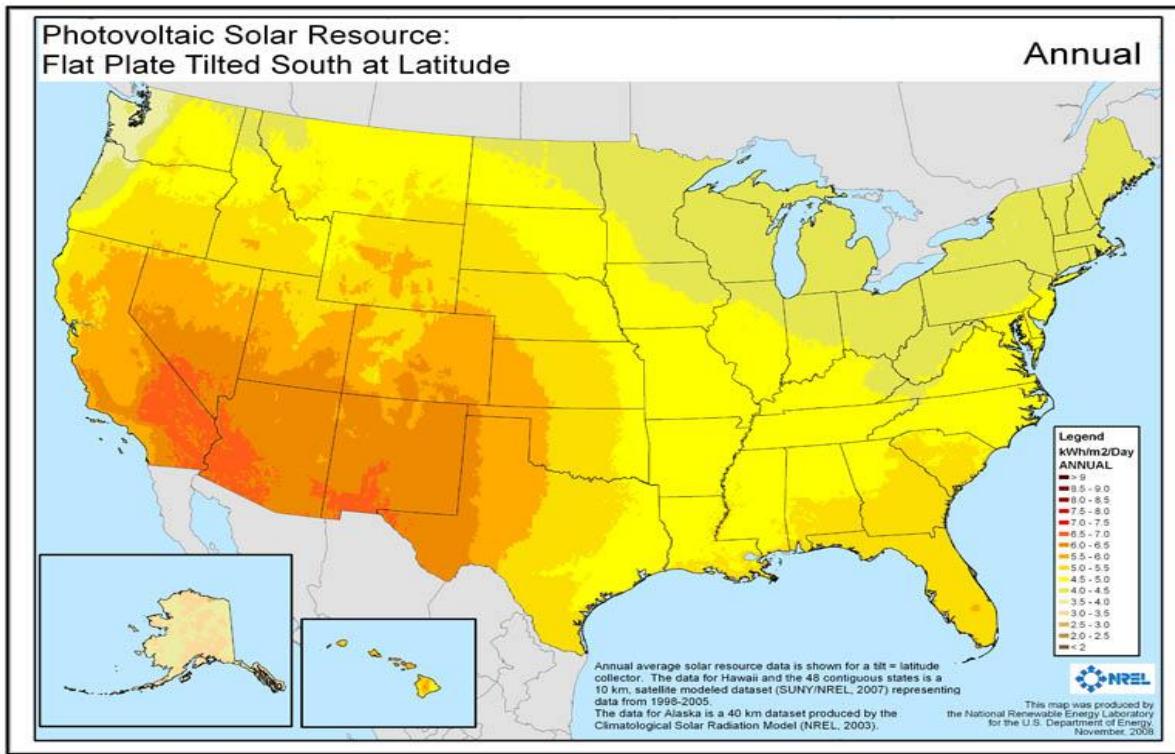


Figure A.F 1: NREL Chart of Solar Resource Data (NREL)

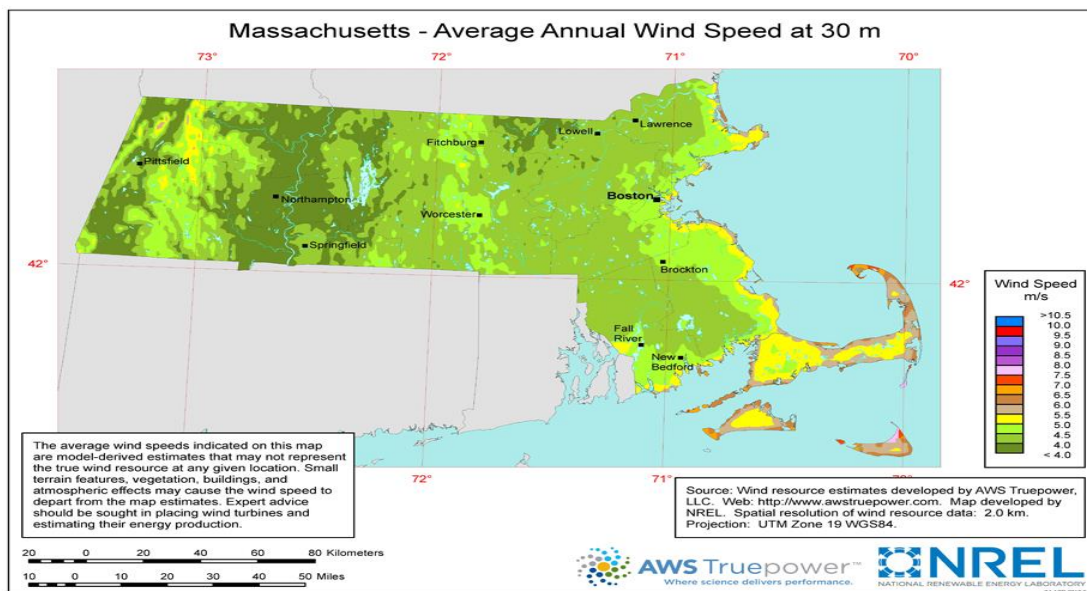


Figure A.F 2: NREL Wind Data for MA (NREL 2014)

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