Business Plan: Consulting Firm focused on Manufacturing Digitalization

Edward Mulford
Western Michigan University, eddie.mulford@gmail.com

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Business Plan:
Consulting Firm focused on Manufacturing Digitalization

Edward Alan Mulford
Western Michigan University
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Chair: Sime Curkovic
ABSTRACT

The goal of this paper outlines a business framework for the development of a digitization consulting firm focused on the manufacturing sector. The firm’s goal is to help organizations in Michigan leverage technology to keep their business vibrant and workers skilled. The primary services for the firm will be related to the implementation of products and services within Industry 4.0, the cyber-physical smart factory industrial revolution. The beginning of the paper explains the ecosystem surrounding digitalization as well as the nine technologies (ex: big data, simulation, additive manufacturing) driving the innovation. The framework for this business plan uses the business model canvas to explain the key relationships and structures of the firm. An analysis of the plan uses SWOT to judge the proposed firm against its competitors as well as assess potential risks.

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1 INTRODUCTION AND PURPOSE

This paper outlines the need for a small-scale niche consulting firm focused on digitalization. The ecosystem analysis, and application into a business model canvas, are to bring awareness to the changing technologies and outline a path to help companies adapt.

Digitalization is not to be confused with digitization, which is simply moving from analog to digital. Gartner defines digitalization as “use of digital technologies to change a business model and provide new revenue and value-producing opportunities; it is the process of moving to a digital business” (Gartner IT, 2018). Thus, the process for manufacturing digitalization is to move manufacturing organizations into new capabilities of organizing their resources and processes in a digital sense. Many companies will need advice on how best to change to this digital world. The consulting firm will be structured to best suit that advisory need. The framework for the business plan was developed using the Business Model Canvas as a clear and concise way to view the value proposition (Osterwalder, 2010). Consulting firms specializing in bridging information in the business ecosystem at a more economical cost than each client having their own in-house team. Thus, it is the preferred business organizational vehicle to help manufacturing firms in their transition to Industry 4.0. All figures referenced are in the Appendix. The term “firm” and “organization” will be used in this paper to refer to the proposed consulting business.

2 ECOSYSTEM OF DIGITALIZATION

2.1 INTRODUCTION TO INDUSTRY 4.0

As a society, we have begun to move into the fourth industrial revolution, which is set to change the way we make, communicate, and work. Before explaining the most recent industrial revolution underway, it is important to understand how the previous ones transpired.
Figure 2: Industry 4.0 in the Appendix describes each revolution main innovations. The first came in 1784 with water and steam power mechanizing production and enabling organizations to create more than what was possible with raw human and animal power (Muzumdar, 2018). The first industrial revolution saw the advent of trains, and large amounts of smog as coal-fueled production (I-Scoop, 2018). Next came the electrification and mass production with the methodologies of Taylorism to make goods like automobiles into an accessible commodity in the early 1900’s (Taylor, 2004). The idea of managing companies production in a scientific manner, with time studies and assembly lines, were some of the key points fueling the second industrial revolution (Favaro, 2015). The second industrial revolution was most known for the Ford Model-T which was produced in an assembly line and made automobiles accessible to the masses. The next industrial revolution, automation from computers and electronic subcomponents grew in the 1965 thanks to Moore’s Law about the number of transistors in a circuit doubling every two years enabling ever cheaper computational power (Favaro, 2015). This computational power became more affordable within the corporate and commercial settings to solve the information storing and data communication needs. This third industrial revolution also saw lean concepts from Deming change the way quality was viewed. Most significantly, the third industrial revolution saw the invention of the Internet and networked computers (I-Scoop, 2018). These connected computers were the key to enterprise resource planning systems that allowed large organizations and their supply chains to coordinate on a deeper level than seen before. Each of the first three industrial revolutions vastly improve capabilities, organize information and transform the raw material into goods.

The origin of term Industry 4.0 comes from the German Trade and Invest group in 2011 to describe the new cyber-physical systems being used to create smart factories (I-Scoop, 2018). While there are many variations of the definition, they center around the four following characteristics:

- **“Interoperability” — machines, devices, sensors, and people that connect and communicate with one another.**

- **Information transparency** — *the systems create a virtual copy of the physical world through sensor data in order to contextualize information.*
• **Technical assistance** — *both the ability of the systems to support humans in making decisions and solving problems and the ability to assist humans with tasks that are too difficult or unsafe for humans.*

• **Decentralized decision-making** — *the ability of cyber-physical systems to make simple decisions on their own and become as autonomous as possible.*” (Marr, 2016)

The Industry 4.0 centers around nine main technologies (Scalabre, 2018):

1. **Big Data Analytics**
   Combining massive amounts of information that can be analyzed to reveal patterns, make forecasts, and understand decision making.

2. **Autonomous Robots**
   Robots that can interact with each other and humans in a safe way to increase the capabilities of both. These robots can be both physical or digital in nature and are already good at replacing repetitive or data-intensive tasks.

3. **Simulation**
   Creating a digital twin of a real-world object to simulate future changes and optimize them. Future operators can test in the digital world and then implement in the physical.

4. **Horizontal and Vertical System Integration**
   Transmitting data and information within the organization and to other organizations. This data network can be used to coordinate operations at an unprecedented scale and skip manual human communication.

5. **Industrial Internet of Things**
   Physical objects connected to trackers that transmit and/or receive data into the cloud. Devices can connect machines, work in process, products in the field, and more which enable real-time responses.

6. **Cyber Security**
   Encrypting, securing, and protecting all of the information being sent and received. Ensuring that data is correct, not tampered with, and not accessible to unwanted outside parties.

7. **Cloud**
Storing information on servers connected to the internet, allowing near millisecond transaction of data across the network. Allows for backing up of real-time data and sharing across organizational boundaries.

8. **Additive Manufacturing**

Using technologies like 3D printing to rapidly prototype and produce without reconfiguring the production line. So 3D printing is most commonly done with plastics, but other materials like powdered metal, composite fiber, organic cells, paper, and concrete are beginning to grow. Additive manufacturing begins to set the limit of production to only needing the raw material being printed, the design, and the energy needed to convert the digital into the physical.

9. **Augmented Reality**

Overlaying the digital world onto the physical one. Can be combined with virtual reality to create a mixed reality between the physical and digital worlds. Used to perceive, understand, and communicate with humans, machines, and the physical world. For instance, Pokémon Go would be augmented reality from your phone, as digital Pokémon are projected into the physical world. Virtual reality would be putting on a headset, like the Oculus Rift, and exploring the digital world.

By combining the four main characteristics from Bernard Marr and the technologies outlined by the Boston Consulting Group, one can get an accurate overview of Industry 4.0. By connecting the machines, systems, and businesses into autonomously executing value chains; the fourth industrial revolution will change once again how we make goods.

For companies, this revolution means that the way they create, service, sell, and operate may become radically different. “As successful companies mature, employees gradually assume that the priorities they have learned to accept, and the ways of doing things and methods of making decisions that they have employed so successfully are the right way to work” (Christensen, 2013, p. 194). As the new technologies outlined above to change the processes and business ecosystem, companies must shift not only their methods but also their culture to stay relevant.
3 Market Analysis

3.1.1 Pain Point

All the radical ideas, trends, and technologies outlined so far will each impact manufacturers and businesses across the globe. The hardest part for businesses is determining how each will impact their industry, how they can use some of the ideas, and what investments are not worth their return. To make these tough decisions requires information: a deep understanding of the current organization and industry, knowledge of the new technology, a vision for what the future can be, and a strategic path to implement this. Most organizations and leaders to think about the future, but many lack the time and resources to fully prepare for this future.

The rate of change is only increasing, as seen by many other innovations. From
Figure 3: Tech Adoption Rates it took the television 39 years to go from 10% market penetration to 40% in America; computers 14 years, internet 5 years, and smartphone 2.5 years (DeGusta, 2012). Already this smart factory revolution is growing. Industry 4.0 is in the second stage, diversifying, of the business ecosystem model developed by Rong and Shi as many partners are working together to further develop digitalization platforms as seen in Figure 1: Business Ecosystem Nurturing Model (Rong & Shi, 2015). Over 33% of companies consider themselves at a high level of digitization at a global level (PwC, 2016). At a global level, investments in the internet of things alone are expected to reach $907B creating $493B in new revenue and reducing costs by $421B per year till 2020 (PwC, 2016). The average investment in this technology is expected to have a return on investment within two years (HSRC, 2018). Because organizations receive so many benefits from digitalization, the pace that they want to adapt it is often more than their organization can handle.

Many surveys, polls, and figures point to how organizations are not ready or able to fully embrace digitalization. According to a poll by PwC of companies, 58% agreed that the largest inhibitor was a “lack of digital culture and training” (PwC, 2016). In a survey of 2000+ companies, the Human Sciences Research Council found that 88% agreed that their business future would be at risk if they delayed their Industry 4.0 implementation (HSRC, 2018). Sapio Research confirmed that most organization effectiveness still relies on manual human communication (phone, email, fax) as 59% of companies do not have real-time visibility to inventory levels within their organization, not including what their suppliers are doing (Sapio Research, 2017). Only a third of manufacturers are able to aggregate information across their value chain, with under 15% having a digital supply chain network (Sapio Research, 2017). While the transition to digital supply chain networks will take time across industries, the work is already well underway. See
Figure 5: Adaptation by Sector on how across industries they are going from an average of 35% digital integration to 71% over five years (Geissbauer, Vedso, & Schrauf, 2016). The data points to how companies need help in implementing Industry.

The solution proposed in this business plan is the establishment of a consulting firm to help bridge the technologies and processes to client companies to smooth the transition to Industry 4.0. As consultants help more companies, they gain experience in implementation and help converge the industry around best solutions. Both results further the business ecosystem progression and follow the learning curve developed by the BCG which explains that the “more experience a firm has producing a [service], the lower its cost (Hindle, 2009) (Rong & Shi, 2015). Just as consulting firms helped spread the DuPont business model of product segments, they will be key to implementing the digitalization of business processes. As Christensen explained in his book Innovators Dilemma, explaining the disk drive industry and industry innovation, new markets are formed by customers and suppliers coming together (Christensen, 2013, p. 165). Consultants are one of the driving forces bringing together the suppliers of the smart factories systems, to the many factories already in existence.

### 3.1.2 Competition

The need for consultants and advisors to companies transitioning to Industry 4.0 is already apparent. Both large traditional consulting firms, as well as boutique and startups, have begun to outline their services for manufacturing organizations across the world.

#### 3.1.2.1 Traditional Consulting Firms

The big three of consulting (Bain, McKinsey, BCG), as well as the big four of accounting (KPMG, PwC, EY, Deloitte), have each started to vie for dominance in smart factories and digitalization. In a 2016 report from the German Mechanical Engineering Industry Association (VDMA), the Boston Consulting Group had over 200 Industry 4.0 projects within the past three years along with 1,500 specialists in the field (Kruppa, 2016). This was vastly more than the 50 projects and 200 specialists of Ernst and Young (Kruppa, 2016). McKinsey has created 13 digital capabilities centers, showcasing and allowing clients to develop Industry 4.0 capabilities. The closest being in Chicago launched in June of 2017 (McKinsey & Company, n.d.). Each firm listed above features sections on their website explaining that they can provide advice.
4 **BUSINESS MODEL CANVAS**

4.1 **VALUE PROPOSITION**

The firm will help its customers create organization agility through digitizing processes taking advantage of new products and services. Change in client’s business processes will result in cost savings, in a timely manner. Clients will be kept updated with the newest offerings in the tech space to be applied to the manufacturing operations.

4.2 **CUSTOMER SEGMENTS**

The firm will primarily focus on consulting to manufacturing organizations in the Midwest of the United States. This is further explained in the Target Market section. Feedback from projects and clients may be sold back to suppliers and key partners to help them further develop their products and solutions. The firm will operate under a multi-sided platform between manufacturing firms (customer), and technology innovation companies (suppliers). The more customers the firm can help; the more insights the firm will learn on what products and services work, as well as the best ways to implement them. This information can be exchanged with the suppliers to make better products. The more supplier organizations the firm works with, the more offerings that can be provided to customers to solve their pains.

4.2.1 **Target Market**

The target market for the firm will be manufacturing organizations within Southeast Michigan.

The manufacturing sector is one of the most vital to future growth and competition. As the fourth largest pool of employees (~11.6 million), manufacturing companies make up nearly 60% of the American export dollars (United Census Bureau, 2017). The highest concentration of employees and companies is in the Midwest, especially as a region for the manufacture of transportation equipment, food, and chemicals (United Census Bureau, 2017). The largest being transportation equipment, made up 17.24% of the $5.5 trillion dollars manufacturing export in the USA. Greater Detroit, Michigan; once the automotive headquarters of the world, still holds the headquarters of America’s largest Original Equipment Manufacturers (General Motors, Ford,
Fiat Chrysler US LLC) and many of their tier suppliers. Although much of the manufacturing facilities and assembly plants have moved outside the area and across the globe, much of the management and development of those facilities are still planned in the area. Southeast Michigan not only houses the old automotive market but also the future in Ann Arbor, where autonomous vehicles are being developed with testing grounds at MCity (Whitehouse, 2017). The University of Michigan, as well as many other academic institutions in Michigan, have been pumping out many of the computer science, and engineering graduates that are fueling the development of autonomous vehicles. The combination of Ann Arbor and Detroit make southeast Michigan a hub for the future of transportation equipment manufacturing. Companies within this region will be focused on developing their production methods to create better, faster and cheaper transportation equipment. Industry 4.0 will enable the manufacturing organizations to be agiler, shorten launch cycles, and better communicate on design changes.

4.3 CUSTOMER RELATIONSHIP

Customers will not be seen by the firm as one-time project transactions; but rather as partners in developing and implementing new technologies to improve their organization. After a project completes, the firm will follow up to assess the long-term impact of the project. Also, as the firm learns of and develops new projects; they will go back to former clients to pitch the projects. As manufacturing relies on a value chain of often many different organizations, clients may recommend the firm to organizations connected in their value chain so that the firm can work to improve the entire process.

Clients can choose projects from the options detailed in the Services section. Customers relationships are most defined in the End to End Client Experience section of the paper. Establish longer-term customers to assist them through the transition to the digitization of their process across functions. Use them to identify some of their suppliers that could use assistance. Continuously increase the efficiency and agility of target client, their supply base, and their customers through continued rounds of optimizing processes and flow of communication.
4.4 CHANNELS

The primary channel of distribution for the firm’s services will be through in-person advising and counseling. While much of the analysis for clients may be done at the office; in-person relationships are the key to customer service. This interaction is explained more in the End to End Client Experience section.

4.4.1 Awareness

For the firm to grow, raising awareness of the capabilities it can bring clients will key. Creating a website and social media presence will be the first step to create a place where potential clients can learn more about the organization. After an online presence is made as a backdrop, in-person interactions at conferences, local events, and professional groups will be used to create personal relationships.

The online presence will focus on creating useful content that motivates people to engage and talk about the firm. Developing useful educational content for readers will be published for free, but with the requirement that readers must provide their contact information and company. This information can then be used by sales to reach out to potential leads already interested in Industry 4.0 and the firm. Potentially referral programs will be developed to motivate and enable clients to become ambassadors on behalf of the firm. This will be modeled after email subscription sites such as Skimm, MorningBrew, and Pursit. Awareness can also be grown through targeted online advertising campaigns.

In person, awareness will be grown through in-person engagement with where potential clients lie. This can come from the attendance at conferences, memberships into professional organizations, as well as many other avenues.

The combination of digital awareness and physical presence will be used to grow the brand of the firm.

4.4.2 Accessibility

Accessibility to the services of the firm will be limited only by the number of consultants and their location. The internet, with email, website, shared calendars, and shared resources
enable the firm to engage with possible clients around the world. Initially, only clients nearby in location will be serviced by the firm.

4.4.3 End to End Client Experience

Contact from the awareness stage of sales will direct potential clients to the website. Automated messaging bots (for instance www.drift.com) will be used to gather information and direct clients to the information and how to get in contact. Therefore, by the time one of the consultants or employees at the firm talk to the client they already have background information. Evaluations of the current operations will be conducted to assess where the firm can best support the client. For each project: a proposal, scope, and plan will be created along with the payment terms so that project creeps and not paying dues can be assessed. Where possible the terms will be set so that the firm realizes revenues from the cost savings of the client; so that both parties are compensated for results-based projects. After a project wraps up, the consultants will write up the processes used and results; so that it can be used in future projects with other clients. The long-term impact of each project will be assessed to make sure that control has been maintained with the change, and that the results have a lasting impact.

4.5 Key Activities

Consulting services will be the primary activity of the firm. Employing consultants and staff to understand client organizations, learning new innovations, and applying them to make the client more flexible in cost, quality, service, and capacity will be the main service. Further explanation of the services to be rendered are under section 4.5.2. To perform the best services, and operate effectively, the firm will be run using the principles of an Idea Meritocracy.

4.5.1 Idea Meritocratic Management

As the firm will be competing in an evolving market (Industry 4.0), it is vital that the firm be able to adapt quickly. While research into the new technologies, their applications, and what competitors are doing will help the firm understand the ecosystem, being structured to take advantage of the opportunities is hard. To have a realistic perspective on the market, employees, and innovation trends, the firm will operate along the principles set for by Ray Dalio on radical transparency for the best people with the best ideas to win.
The management principles use weighted decision making on ideas, combined with radical feedback and transparency. Ray Dalio, a billionaire hedge fund manager, used the principles to grow Bridgewater Associates, LP into one of the world’s largest hedge funds with $102 B assets under management in 2016. An Idea Meritocracy uses the principle that an organization should be run by the best ideas. Rather than being a democracy with equal rights, or an authoritarian regime where only top management makes decisions, the meritocracy gives votes to all but weights them based on the voter (Dalio, 2017). The voter is weighted by past decisions results, understanding of a topic, and so on. For instance, a voter with programming background in augmented reality and years of experience would have a greater say on a vote related to what software was best for augmented reality. The other principle of radical transparency has employees give constant feedback to each other, as well as make more decisions public. “[Radical Transparency] enforces good behavior and good thinking because when you have to explain yourself, everyone can openly assess the merits of your logic” (Dalio, p. 342). Although radical, the transparency is not complete as information that is private, confidential, or has long-term consequences (Dalio, 2017). For example, compensation amounts would not be shared as it would be a distraction that did not improve the firm. Combined idea meritocratic decision and radical transparency would be integral to the management of the firm.

The firm would use the principles to better understand their market, make decisions, and best help clients.

### 4.5.2 Services

Below are outlined potential services to be performed by the firm:

- **Benchmarking**

  Comparing a client’s operational key performance indicators to their industry. This will be done by gathering data about the client and their industry to make useful conclusions about the health of their operations. This can be used to break down costs into should be, as well as figure out what competitors are focusing their resources on. Benchmarking gives clients a perspective on where their resources and capabilities lie as far as competencies.

- **Culture Training**
Helping shift the values of a company to change the way the process is seen and evolve which ultimately impacts the effectiveness and efficiency of the resources of the organization. Teach employees in the organization about what the future may hold so that they support changes that may need to happen. This is often one of the largest challenges related to successful digitalization (I-Scoop, 2018).

- **Implementation Projects**
  Digitalization of a process or service using the DMAIC and PDCA approach. Help company identifies the new processes or services other companies can offer, as well as implement them into the organization. As a part of this, the firm would work to ensure the new process/service is sustainably implemented. Below are some areas that may be considered for projects:
  - Cost savings
  - Revenue generation
  - Performance, quality, or service improvements

- **Current Best Practice Whitepapers**
  Report out on the projects and services listed above. This is a marketing tool to explain what the firm is capable of, as well as the results it can help other clients achieve.

### 4.6 **RESOURCES**

#### 4.6.1 **People**

By far the most important resource for the firm will be the employees. Finding and developing talent to serve with be one of the main priorities. The knowledge that the employees bring and develop into the firm will allow it to better consult with clients. Specifically, knowing the most cost-effective route to improve the client's bottom line will be needed by the employees.

#### 4.6.2 **Location**

Location is key to any business, even in a world connected by the internet. The firm will be based in southeast Michigan to begin its operation. As defined in the Target Market section, the target clients are concentrated in that area of the United States. Therefore, to better service them, the firm’s office will be in the area.
4.6.3 **Legal Structure**

The firm is to be set up under a limited liability partnership. As LLP, partners will be the ones investing in and controlling the decisions related to the firm. As outlined in the Idea Meritocratic, the partners will use radical transparency to manage how they serve customers and the firm. Many of the competitor firms are also structured as LLPs.

4.7 **Key Partners**

Suppliers and partners will be the key partners of the firm. Truly understanding how the clients operate and what their needs are can help the firm develop the technology suppliers. Suppliers new products can be then promoted to clients who would be best serviced by them. The firm will act as a middleman to bridge the new Industry 4.0 products and services. As the firm develops, it will deepen relationships with the clients and suppliers it is most successful with.

4.8 **Cost Structure**

4.8.1 **Operational Costs**

The primary startup costs for the firm will be related to setting up the legal and financial entity, developing the brand through the website and flyers, and in developing the first relationships between customers and suppliers. Initially, the firm will start “in the garage” so that larger expenses like office space can be taken on after initial revenue comes in. As the firm grows it can add to staff members to improve the capacity that it can service. Since the firm is structured as an LLP, funds will primarily come from self-financing and loans.

Ongoing operational costs will primarily be labor, office space, software to run the business, and marketing materials.

4.8.2 **Revenue Streams**

There would be multiple revenue streams for the firm. Hourly billing for projects with fees due at each phase gate in the project to smooth out cash flows. Flat rates for benchmarking, KPI, demos, and training modules. Flat rate for retainer clients on a per period basis and to be renegotiated. Retainer clients would get dedicated resources and be able to greater project
outcomes due to the firm’s familiarity with their organization. Published white papers would have fees for full access but have free abstracts. Pricing would be set according to industry standards. Referral bonuses would be given to clients who recommended other clients that paid for a service.

5 ANALYSIS OF PLAN

5.1 STRENGTHS

The three primary strengths of the business plan for a digitalization consulting firm rely on its people, understanding the innovation process, and a network of clients.

Since the primary resource of the firm will be its people, it can be more flexible when adjusting to changes in the market. For instance, if a new innovative idea is just released, the team can quickly learn and work on implementing it. Conversely, if a client cancels a project, or enough clients cannot be maintained, the human resources can focus on research and find new clients. Ultimately, since firm relies on labor, it’s liabilities are mostly related to the workforce rather than costly assets or platforms that can be outdated.

By using an idea meritocracy to evaluate new services and products that the suppliers offer, the firm will be more flexible. Traditional consulting firms with “the rigorously analytical, data-driven processes that help [big consulting firms] create value for its clients in existing, relatively stable markets render it much less capable of building a strong client base among rapidly growing companies in dynamic technology markets” (Christensen, 2013, p. 194). Therefore, by staying nimble and taking educated risks, the firm will be able to outperform larger competitors.

The location of the firm in southeast Michigan will help it grow with the developments, as well as recruit from an educated workforce.
5.2 Weaknesses

People are one of the greatest strengths as well as weaknesses of the organization. Being able to find talented, innovative leaders will be the limit to growth. Consultants making a bad impression on clients or suppliers comes with great branding and legal risks.

Structuring as an LLP has multiple weaknesses. It will be harder to raise capital and finance as shares cannot be sold, nor will venture capitalists typically invest. As an LLP, partners are incentivized to not audit each other as they will maintain plausible deniability if they are unaware of the actions of fellow partners. Also depending on how the LLP is structured, certain partners may have more power than others. The radical transparency and idea meritocratic principles seek to solve the management concerns.

5.3 Opportunities

Due to Industry 4.0 being an emerging market, it brings with it many opportunities. By learning to better automate factories and production; the firm can use the principles and services learned to apply to other markets. For instance, learning how to foster a culture of innovation could be applied to any organization, like non-profit and government sectors. By applying the experience curve to employees in the organization, coupled with utilization of emerging technology, the consultants in the firm can quickly grow their experience and offerings (Hindle, 2009). Working with key partners as well as clients can create new offerings for smart factories.

5.4 Threats

Some of the greatest threats of the plan outlined thus far is the perception of consulting, reliance on one industry, large competition, and unpredictability of the future of Industry 4.0. The negative view of consulting stems from businesses viewing consultants as people that come in with many buzzwords, the latest management fad, solutions that are based only on theory, lots of overly sophisticated formulas, and unactionable plans (Wright, 2002). Also, fear of internal employees seeing the consultant team as only there for cost cutting and removing jobs will make them less forthcoming in explaining the current situation to a client. To overcome this, the firm must brand itself with successful projects that not only achieved financial results but did so in a sustainable growth perspective rather than a surgeon trimming off the waste. Being focused on
the transportation equipment industry provides many potential clients; but if the entire sector were to take a downturn like the one in 2008, the firm's customer base would quickly dry up. In the event of that happening, the firm could focus on other manufacturing within the Midwest such as large appliances, and chemical. Another large threat to the firm is the sheer amount of competition growing in the Industry 4.0 consulting space as outlined in 3.1.2. To protect itself, the firm must be able to find multiple niche markets within Industry 4.0 to stay competitive against firms with far more resources. Finally, there is a large amount of unpredictability in Industry 4.0. “Experts’ forecasts will always be wrong. It is simply impossible to predict with any useful degree of precision how disruptive products will be used or how large their markets will be” (Christensen, 2013, p. 178). That combined with cyber threats such as hacking make the industry risky. Overall, the firm can mitigate as much of these treats as possible through results-based branding, establishing niches, and making adaptability a core competency.

6 Conclusion

In summary, the firm outlined above will help transportation equipment manufacturers in Southeast Michigan transition to Industry 4.0. The transition to smart factories is already underway with multiple technologies like cloud systems; additive manufacturing, and the industrial internet of things. The return on investment can be huge for manufacturers, with many projects having short time frames. The largest challenge for manufacturing firms is to know what to and when to invest in these solutions. Although there is already growing competition; the firm's uniquely small size and use of idea meritocratic principles will give it an edge to help innovate and serve customers. The region around southeast Michigan is situated to be a hotbed for autonomous vehicle development in America, as well as the production systems needed behind them. The firm will act to bridge the suppliers of these new systems to the manufacturing organizations using them day to day. By keeping organizational costs low, the firm can become highly profitable in servicing clients through multiple revenue streams.
7 REFERENCES


8 APPENDIX

Figure 1: Business Ecosystem Nurturing Model

Business Ecosystem Lifecycle Model with nurturing steps

(Rong & Shi, 2015, p. 215)
Figure 2: Industry 4.0

(Muzumdar, 2018)
Figure 3: Tech Adoption Rates

U.S. Technology Adoption Rates
U.S. market penetration for nine technologies shows the speed at which they gained traction, reached maturity, and achieved saturation. Data through 2010.

**Faction:** Time from consumer availability to 10% penetration

- **Slow:** Telephone, Electricity
- **Moderate:** Radio, Television, Computer, Mobile phone, Internet
- **Fast:** Smart phone

**Maturity:** Time from 10% to 40% penetration

- **Slow:** Telephone, Electricity
- **Moderate:** Radio, Television, Internet
- **Fast:** Computer, Mobile phone, Internet, Smart phone

Tablets are omitted, having achieved the 10% traction threshold in 2011.

**Saturation:** Time from 40% to 75% penetration

- **Gradual:** Telephone, Electricity
- **Moderate:** Radio, Computer, Mobile phone, Internet
- **Fast:** Television

Smart phones are omitted, having achieved the 40% maturity threshold in 2011.


*Market penetration is percent of U.S. households (telephone, electricity, radio, TV, Internet) or percent of U.S. consumers (smartphone, tablet).

(DeGusta, 2012)
Figure 4: IOT Funding

Venture funding in IoT and connected technologies has more than doubled in the last five years

Venture Funding in Industrial IoT Related Segments ($M, 2011 – 2015)

Source: PwC/NVCA Money Tree Report based on data from Thompson Reuters

(PwC, 2016)
Figure 5: Adaptation by Sector

Exhibit 1: Adoption of Industry 4.0, by Sector

Respondents were asked: "How would you classify the current level of digitization and integration (in operations, supply chain, and related activities) in your company? What levels are you expecting in the next five years?"

<table>
<thead>
<tr>
<th>NOW</th>
<th>IN FIVE YEARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>45%</td>
<td>Electronics</td>
</tr>
<tr>
<td>32%</td>
<td>Aerospace and Defense</td>
</tr>
<tr>
<td>35%</td>
<td>Industrial Manufacturing</td>
</tr>
<tr>
<td>32%</td>
<td>Chemicals</td>
</tr>
<tr>
<td>38%</td>
<td>Forest Products, Paper, Pkg.</td>
</tr>
<tr>
<td>28%</td>
<td>Transportation and Logistics</td>
</tr>
<tr>
<td>30%</td>
<td>Engineering and Construction</td>
</tr>
<tr>
<td>41%</td>
<td>Automotive</td>
</tr>
<tr>
<td>31%</td>
<td>Metals</td>
</tr>
</tbody>
</table>

(Geissbauer, Vedso, & Schrauf, 2016)