CENTER FOR SMART LOGISTICS

Business Plan – 17/07/2020

State of the Business Plan

Through extensive market research, including the Center for Smart Logistics team has completed a market analysis of the transportation, distribution and logistics sector. The market analysis defines the opportunities for the Center to modernize logistic systems at inland ports and position the Southland as a nationwide center of logistics innovation. The mission and vision for the Center has been clarified through this market analysis, as have the range of viable business models, products and services, and customers that the Center could pursue.

We were able to cultivate relationships with key players in freight automation, which has led to a concept proposal to develop a field testing for using autonomous trucks to move containers between facilities within an intermodal logistics park.

Since the submitting the working draft in March, the CSL team have organized several rounds of in-depth discussion with potential partners and industry experts. This draft describes the further developed the abovementioned field testing project and refines the business plan by incorporating feedback from potential clients and partners to formulate the operation and financial plan that is viable and market-ready in the next two years to ensure the Center's success. The refinement will address identifying specific products and services, intellectual property issues, customers, and operational and financial plans for the Center.

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I. Mission & Vision

The Center for Smart Logistics (CSL) would establish a Center in the Chicago Southland to foster the development of technologies related to automation of inland ports and associated facilities. The CSL is an intervention to address barriers in the research and development phase of the automation of supply chain for inland ports. The mission of the CSL is two-fold:

1. **To bring products and services to market that will modernize logistics systems that center on inland ports, allowing them to move more volume and be more productive.**
   The CSL would give intermodal logistics centers, as well as manufacturing facilities, warehouses, and e-fulfillment centers, affordable tools to digitalize, modernize, and integrate their systems, thus making them capable of moving more goods with fewer resources. The CSL will also allow these entities, often in urban areas, to move goods in small areas, thus maximizing spatial efficiency. The CSL will allow these entities to keep up with industry trends, including more cargo being handled by logistics centers. Nearly 40 seaports have already started to adopt automated guided vehicle (AGV) technology[1]; inland logistics facilities must be prepared to process increased cargo throughputs from the automated seaports. The CSL would positively impact the global supply chain by giving inland ports the means to stay competitive in the next economy.

2. **To make the Southland the nationwide center of logistics innovation, thus bolstering the region's productivity.**
   From an economic development perspective, Chicago Southland leaders need to reinforce and strengthen the region as a 21st century transportation, distribution and logistics (TDL) leader. The Southland is already an economic powerhouse - especially because it boasts the nation's largest inland port - but its stature as such needs to be continuously reinforced. We need to look to the future of TDL to ensure that the Southland remains competitive in the changing economy.

   One way to do this is to make the Southland *the* place to develop innovative technologies for the TDL sector. This could make it the ideal location for firms to relocate, either to develop and produce digital logistics technologies, or to take advantage of new technologies being developed nearby. Furthermore, if the Southland can lead the logistics industry through innovation, it will make the region a nationwide leader in firm productivity. Firms will relocate to maximize productivity, not only through advanced technologies, but by other efficiencies that come from colocation.

[1] CSL Overview

II. Market Analysis

A. Overall Opportunity

It's clear there is an opportunity to improve automation technologies and their adoption process in inland logistic systems, as well as to improve productivity and reduce costs, which would allow inland logistics systems to increase shipping volume. So far, the market has not fully embraced adoption of automation technologies into inland logistics systems. Interviews reveal varying efforts among major railroads to adopt automation technologies, as well as research gaps among equipment manufacturers and operators in both soft and hardware areas. Furthermore, current front-runners in inland logistics automation (which include some railroads and equipment manufacturers) are independently conducting research and development, possibly heading toward compatibility and integration issues in the future.

An intervention like the Center for Smart Logistics may be the only way to accelerate the development and adoption of automation in an efficient manner that will lead to the improvement of inland logistics system across the Chicago region and beyond. Because the Chicago Southland holds the largest inland port in the U.S., it is an ideal location for this nascent market to develop.

B. Market Context

Research on global, national, and local market conditions elucidates the opportunity for the CSL to accelerate the development and adoption of automated inland logistics systems for the benefit of Southland and beyond. Market conditions include:

- **Global consumer trends are prompting transformation in the logistics industry.** There is an increasing need for faster and more complicated container handling by inland ports and intermodal logistics centers, manufacturing facilities, warehouses, and e-fulfillment centers.
  - *The volume of shipping continues to increase.* Urbanization[2] and growth in the global population[3] has caused a sharp rise in goods being moved.[4] For example, the quantity of goods carried by containers in seaborne trade has risen from 102 million tons in 1980 to 1.83 billion tons in 2017.[5] In 2018, ports worldwide handled upwards of 785 million TEUs,[6] up from 753 million TEUs in 2017.[7]
  - *Customer expectations are changing as the e-commerce market grows.* The advent of e-commerce has prompted customers and businesses to expect shipping to be faster, more flexible, and at a lower cost. For example, Amazon, which accounts for 40 percent of online retail sales,[8] recently set a standard of one-day shipping. Tangentially, consumers also demand a greater variety of goods. Manufacturing is becoming more diverse and customized, making logistics

[2] https://www.un.org/development/desa/en/news/population/2018-revision-of-world-urbanization-prospects.html
[3] https://www.un.org/development/desa/en/news/population/world-population-prospects-2017.html
[4] https://www.pwc.com/gx/en/transportation-logistics/pdf/the-future-of-the-logistics-industrv.pdf
[5] https://www.. statista.com/topics/1367/container-shipping/
[6] http://www.worldshipping.org/about-the-industry/global-trade
[7] https://stats.unctad.org/handbook/MaritimeTransport/Indicators.html
[8] https://www.digitalcommerce360.com/article/us-ecommerce-sales/

more complicated.[9] The growth of the e-commerce market, up to $517 billion in 2018 from $450 billion in 2017, or 15 percent, is also putting greater demand on logistics centers, warehouses, and e-fulfillment centers.[10]

- **Increased container traffic and market conditions motivate a need to grow the capacity of inland ports.** As automation of seaports advances across the world in response to an increase in global trade, it is easy to imagine that inland ports and other inland intermodal logistics centers will be choking points. There is a market opportunity for solutions that will increase the capacity of inland ports to handle cargo.

  - *Vessel sizes have increased, causing congestion at ports and distribution networks.* The automation of seaports is partly motivated by the increase in vessel size. On the Asia-US East Coast trade route, the average vessel size for containers in 2018 rose to 8,666 TEUs, up from 5,743 TEUs in 2014. This growth may be attributed to the opening of new locks in the Panama Canal, which increased the maximum vessel size to 14,000 TEUs from 5,000 TEUs. The Asia-US West Coast trade route went from 7,034 TEUs to 8,185 TEUs in that same period.11 Larger vessels means that more containers are being offloaded at once, causing more congestion on distributing networks, like roads and rail. Inland ports and intermodal centers must be able to handle increased traffic and higher-capacity vessels.

  - *Volatile diesel prices and high labor turnover may make cross-country transportation of cargo through trucking less cost effective.* The cost of diesel prices averaged $3.179 per gallon in 2018, up from $2.654 per gallon in 2017. Diesel prices have since dropped, but the long-term volatility and uncertainty of diesel prices add challenge to proactive planning. While electrification of heavy-duty trucks may ease future costs, the market is still nascent: by 2025, the penetration of electric powertrain is only expected to be 12.3% in heavy-duty trucks.12 Additionally, the Bureau of Labor Statistics study finds that there is exceptionally high labor turnover in long-distance truckload motor freight. To minimize costs, employers are forced to accept the high turnover rate, reduce the number of truck in operation, or offer higher wages. More cargo being handled by inland ports would reduce demand for long-distance trucking. Compared with long-distance trucking that requires drivers to be consistently away from home, regional trucking that distribute shipments within an urban area provides more attractive form of employment, and typically, short-distance trucking has less turnover.

  - *Faster, more complicated shipping standards are creating a new paradigm.* Changing customer expectations—including faster, more complicated shipping—will require larger, more efficient warehouses and a greater number of distribution points throughout the nation, many that are far from seaports.13 Warehouses and distribution points closer to urban centers will help customers receive goods faster. However, available sites for warehouses and distribution points tend be

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[9] Ibid.

[10] https://www.digitalcommerce360.com/article/us-ecommerce-sales/

[11] https://www.midwestinlandport.com/shippers-leveraging-americas-inland-ports/

[12] https://www.pmewswire.com/news-releases/global-commercial-vehicle-electrification-market-2018-2025—growth-opportunities--strategic-imperatives-for-electric-md--hd-truck-market-300743961.html

[13] https://www.ioc.com/trucking-logistics/trucking-equipment/automated-trucks-warehouses-seen-transforming-distribution 20160914.html

smaller in urban areas. Automation will enable compact urban facilities to operate efficiently and safely.

- **Autonomous technology can have a significant impact in the logistics industry, and is widely considered the future of the transportation and logistics industry**.[14] Autonomous technology is a solution to increase the cargo handling capacity of inland ports or intermodal logistics centers, as well as at manufacturing facilities, warehouses, and e-fulfillment centers.
  - *Successfully automated ports could have significant economic impact.* It is estimated that automation, if done correctly, can reduce operating costs by 25 to 50 percent, and increase productivity by 10 to 35 percent. For a port that handles 6 to 8 million TEUs per year, automation could create more than $1.5 billion in value.[15]

  - *Container ports around the world are turning to automation.* As of 2018, there were over 40 fully or partially automated container ports worldwide. In the past six years alone, 20 ports installed equipment to automate processes.[16]

  - *Port automation offers environmental benefits*. Increased pressure to address the environmental impacts of freight is adding to the demand for automatization. To address both localized air quality and public health concerns near freight facilities as well as the threat of global climate change, reducing emissions from the transportation sector – now the largest contributor to greenhouse gas emissions in the U.S. – is a high priority. Many autonomous vehicles and pieces of machinery, including those meant for use within ports, are designed to be entirely electric, which is a more sustainable power source than diesel fuel, particularly as solar and wind power make up a larger share of the energy supply. In addition, automation can allow ports to operate within a smaller physical space, leading to a smaller environmental footprint. Environmental benefits have motivated many of the State of California's investments in port technology, including $205 million in projects that support clean freight technologies.

- **Relevant AGV technology exists and has proven effective in U.S. seaports and European inland ports.**
  - *AGV technology is being used in smaller, indoor environments. Warehouses, e*-fulfillment centers, manufacturers, and assembly plants already use AGVs for purposes like as driverless carts, robotic parts bins and autonomous tuggers. In these situations, AGVs are more flexible than conveyor systems. However, these AGV applications are generally on a smaller scale, costing $100,000 to $150,000, and rely on defined paths or areas to operate within. 17

  - *AGV technology is rapidly advancing.* AGV technology is more advanced than even a decade ago, as AGVs are more precise, easier to program, and less expensive. The AGV market is competitive, especially as new firms enter the market and drive prices down. AGV advancements are marked by improvements in software, safety systems and batteries, and are

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[14] https://www.ioc.com/trucking-logistics/trucking-equipment/automated-trucks-warehouses-seen-transforming-distribution 20160914.html
[15] https://www.mckinsev.com/featured-insights/future-of-work/ai-automation-and-the-future-of-work-ten-things-to-solve-for#part3
[16] https://www.mckinsev.com/industries/travel-transport-and-logistics/our-insights/the-future-of-automated-ports
[17] https://www.assemblymag.com/articles/92791-a-new-generation-of-agvs-are-appealing-to-small--and-midsize-manufacturers

enabled by related improvements in Wi-Fi connectivity and battery storage. The entire ecosystem of autonomous vehicles and the Internet of Things has improved, making it such that many AGVs are not custom designed, but use off-the-shelf products.18

- *Seaports in the U.S. have already implemented AGV technology.* Seaports moving significant amounts of cargo have leveraged cutting-edge technology to accommodate increased complexity and volume of shipping; however, inland ports and logistics centers have yet to follow suit. Long Beach and Los Angeles are undertaking a massive integration of autonomous technologies into their terminals; the Port of Long Beach recently implemented autonomous technology in their Middle Harbor Terminal, lowering operating costs and increasing handling capacity for that terminal from 1.3 to 3.3 TEUs per year. The ports sharing the costs with the State of California, the shipper Orient Overseas Container Line, and TraPac, a container terminal operator. The ports of New York and New Jersey and Virginia International Gateway have also adopted semiautomatic handling of containers.

- **Despite promising returns, there are still significant issues in implementing and maintaining automation technologies that need to be addressed.** Although relevant technologies exist, there are issues with cost, related software, mechanical systems, and human capital that prevent autonomous solutions from being fully effective. Current issues with autonomous technology in ports may actually cause ports to experience a 7 to 15 percent decrease in port productivity, depending on the how well the new technology is integrated with existing systems.[19]

  - *Upfront capital outlays for automation of ports are high, and may be cost-prohibitive for the actual return on investment*. For example, it is estimated that the Port of Long Beach spent $1.3 billion to automate their Middle Harbor Terminal. A McKinsey survey of senior-level port executives estimated that automation would cut operating costs by upwards of 25 to 55 percent; however, realized figures have shown cuts in costs at merely 15 to 35 percent.20

  - *Operational characteristics of seaports are different from rail terminals.* As noted earlier, automation of seaports has been partly motivated by the increase in vessel size. With the introduction of new-Panamax and even post-Panamax ships that can be vastly larger than traditional vessels, the ability of container ports to unload and load containers expeditiously became a critical issue. For ports and also maritime freight businesses, berth throughput and turnover are critical for the bottom line. While container ships typically carry thousands of containers (upward of 15,000 20-foot containers), even the longest freight trains carry only a few hundred containers (typically 100-200). Also, container ships carry their loads in multiple stacks, trains carry no more than two stacked containers. This result in containers ports being much more compact than typical rail terminal. For example, the Middle Harbor terminal at the Port of Long Beach that is being automated is approximately 1 mile long while many rail terminals are double that, resulting in much longer horizontal movements of containers and AGVs in the latter. In other words, in the past, automation was needed at the seaports more than at inland ports. It is not yet known how much effect these differences in operational

[18] https://www.assemblymag.com/articles/92791-a-new-generation-of-agvs-are-appealing-to-small--and-midsize-manufacturers
[19] https://www.mckinsey.com/industries/travel-transport-and-logistics/our-insights/the-future-of-automated-ports
[20] https://www.mckinsey.com/industries/travel-transport-and-logistics/our-insights/the-future-of-automated-ports

characteristics have on the return on investment for automation, but it is reasonable to assume that incentive is greater for seaports. The operational differences will also affect optimal design of equipment, system, and facilities. While forward looking equipment manufacturing companies are engaged in research and development to commercialize automation of inland facilities in partnership with railroads, it is not yet fully deployed.

- *The current capital investment model is outdated.* In the traditional investment model for ports, terminal operators front-load investments, despite the value being dispersed. It is estimated that terminal operators only capture 20% of the value pool, despite fronting most of the cost to automate.21 The digital age of intermodal logistics center operations may require coordinated thought about how equipment suppliers or operators may be able to disperse the cost.

- *Existing AGV equipment can be improved.* There is currently very little research about AGV maintenance and dealing with breakdowns. Additionally, AGVs are largely battery powered, which can lead to a cumbersome recharging process for users, especially when too many AGVs need to be charged at once.

- *Port automation and AGV technology are ill-equipped to handle exceptions.* Automation relies on consistency; when an event out of the ordinary occurs, getting the system back on track may hamper productivity. Slight disruptions to AGV operations can delay center operations for hours, which make outdoor operation of AGVs risky; changes in weather could be problematic. McKinsey also suggests that old, complex port processes create opportunities for exceptions to the rule, and redesigned, automation-ready processes are needed to be fully effective.

- *IT systems to support AGV technology are haphazard and fragmented.* Data systems at most ports are ill-equipped to process the immense data that is needed to operate and will be generated by autonomous systems. Generally, data for different port processes is currently stored in a siloed manner, and may lack a way to integrate. For example, data generated by unloading cargo from a vessel may be stored in a different database than data generated inside a logistics center. Autonomous systems require complex, unified data structures to effectively operate.22 Additionally, cybersecurity for port software is often ill-equipped to protect the additional systems related to automation.23

- *There's a lack of skilled workers in automation.* Positions related to automation, especially positions related to planning for and implementing autonomous infrastructure, are difficult to hire for. Even skilled engineers in related fields may need as long as five years to train. In a survey by McKinsey of senior-level port executives, 75 percent of respondents with experience in port automation believed that a shortage of people with the right skills was a challenge.24

- **These issues have prevented inland ports, along with other intermodal logistics facilities in the U.S. from implementing fully automated systems.** The current issues with implementation,

[21] https://www.mckinsey.com/industries/travel-transport-and-logistics/our-insights/the-future-of-automated-ports
[22] https://www.mckinsey.com/industries/travel-transport-and-logistics/our-insights/the-future-of-automated-ports
[23] https://cerasis.com/logistics-industry/
[24] https://www.mckinsey.com/industries/travel-transport-and-logistics/our-insights/the-future-of-automated-ports

combined with the high up-front cost, serve as a barrier for inland ports to pursue the adoption of autonomous technology. The market for AGV technology is both established and evolving, but market has not organized around an opportunity to move cargo within inland ports and other intermodal logistics centers, as well as outside manufacturing facilities, warehouses, and e-fulfillment centers. AGV technology works well for high capacity ports, as well as small-scale warehouses, but solutions have yet to be developed to accommodate what's in-between.

- *Generally speaking, inland ports handle a smaller number of containers than seaports; the market is missing a cost-effective way to implement AGV technology that integrates well with existing processes.* The busiest ports in the U.S., in Long Beach and Los Angeles, handled 8.1 million[25] and 9.46 million[26] TEUs in 2018, respectively. The twenty intermodal logistics centers in the Chicago Southland handle a combined 17.5 million TEUs; however, smaller terminals throughout the nation may handle less than a million TEUs per year. For example, the BNSF Intermodal and Logistics Park in Kansas City can only handle 500,000 containers per year, and the Central Florida Intermodal Logistics Center in Winter Haven, Florida can only handle 300,000 containers a year. Given the huge capital outlays required for automation, smaller ports may not be able to take on the risk of implementing a system that doesn't live up to expectations until the technologies mature and there are sufficient data to make investment decisions.

- *Automation may be applied to smaller logistics centers, like warehouses and e-fulfillment centers.* Warehouses and e-fulfillment centers may currently use AGV technology on a much smaller scale inside to move smaller amounts of goods from shelves to packing areas, for example. There's an opportunity to apply better-developed AGVs to the container unloading process that occurs outside warehouses and e-fulfillment centers, especially as more will be built in urban areas to satisfy consumer demand for shipping.

- **The Chicago Southland is the ideal place to develop these solutions, and to serve as a model for the future of inland ports.** The CSL and its customers would have a competitive edge in the Southland versus any other location. The development of AGV-related technology for inland ports is best served by the economic ecosystem and resources available in the Chicago Southland.

  - *The Chicago Southland is already a leader in the TDL industry, especially as a hub for multimodal transit.* AGV technology may be cost effective for Southland firms, whereas it might not be in smaller environments. The Southland features the largest inland port in the country. Altogether, the twenty intermodal terminals in the Chicago region handle 17.5 million TEUs per year, compared to 15.7 million TEUs per year by the Long Beach and Los Angeles ports combined. Only a handful of inland ports handle more than 1 million TEUs per year, whereas the BNSF Logistics Park and CSX Bedford Park each handle more than 2 million TEUs per year. Despite a high start-up cost, the rewards are substantial: as stated above, Long Beach increased handling capacity from 1.3 to 3.3 TEUs per year. Furthermore, AGV technology is

[25] https://gcaptain.com/port-of-long-beach-tops-8-million-teu-in-fy2018/
[26] https://worldmaritimenews.com/archives/268790/port-of-los-angeles-sets-new-all-time-cargo-record-in-2018/

expected to worth $1.5 billion of value for a mid-size port.

- *It hasn't fully capitalized on its location and multimodal-based advantages, and could experience substantial economic growth.* The deployment of AGV technology in the Rotterdam port demonstrates the economic gains that can result from increased efficiencies from AGV technology;[27] there is a high likelihood that growth could be replicated in the Southland.

- *New development of intermodal centers could provide a testbed and initial customer-base for products developed at the CSL.* CSX plans to build a new intermodal terminal and industrial cluster in Crete, IL, and "is committed to investing in the latest automated technologies in their intermodal operations and in the connection between their operations and surrounding industrial development."28 Furthermore, Northpoint Development is currently develop a site with BNSF, and has indicated interest in developing automation systems for this project.

- *There are several firms in the Chicago Southland who could serve as an initial customer base.* There are several companies developing smart technologies in the Chicago Southland, but are currently working on similar or complementary products independently of each other. An intervention like the CSL could bring together different firms to coordination development of advanced technologies. For example, Mi-Jack Products has developed Mi-Star to monitor and manage yard equipment, AccuSteer, a GPS-based navigation system, and AccuStack, an inventory management system utilizing GPS technology to manage product location and retrieval, among others. Mi-Jack is planning to prototype a complete smart container storage and stacking system called the Intermodal Terminal Management System (ITMS) in a new facility in Chicago Heights that is currently in development. Canadian National (CN), a Class One railroad, is working to design, deploy, and test new automated equipment stations (called "flippers") for unloading and loading containers from trucks at its intermodal yard located in Harvey, IL.

- *The Southland has several other advantages for firms to relocate.* It is currently serviced by seven freight railroads, five expressways, two international airports, two intermodal terminals, barge shipping, and immediate access to the Port of Chicago. It also has several parcels of undeveloped land. The Southland also has a workforce that is ready to adapt to new technologies and increased output, and several institutional anchors that can support TDL innovation.

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[27] "Why Is the Port of Rotterdam More Automated Than Oakland?" Accessed March 24, 2020. https://www.flexport.com/blog/port-automation-oakland-rotterdam/.

[28] EDA Grant

C. Implementation models from market research

Market research to date has identified several models that the CSL could emulate to deliver the decided products or services to the market. These include:

- **Fraunhofer.** Fraunhofer is a registered 501(c)(3) that "develops and validates scientific applications and technologies for industrial innovation."[29] It earns 70% of its income from contracts with industry projects, whereas the other 30% comes from government or institutional grants. This allows Fraunhofer to absorb some of the higher costs associated with some types of preliminary research.

- **EWI.** EWI is nonprofit center that develops, tests, and implements new technologies for several different industries. EWI contracts with firms to offer applied research, manufacturing support, and strategic services. EWI is also a collaborative center; its membership program allows firms to access 150 subject matter experts for their own projects. EWI offers shared, competitive research; it is not a testing facility.

- **Mcity.** Mcity is an advanced mobility research center based out of the University of Michigan; it is a collaboration between government, academia, and the private sector (including major auto manufacturers in the Detroit area). The center's main value-add is as a testing facility for autonomous vehicles: private roads to mimic real-world conditions. It also facilitated a testing environment on Ann Arbor streets, and developed a driverless shuttle for UM students.

- **AllianceTexas Mobility Innovation Zone.** AllianceTexas is a multimodal development by Hillwood in the Dallas-Fort Worth area that contains an inland port, as well as a corporate park. The Mobility Innovation Zone is being positioned as a "do-tank" for partners to develop, test, scale, and commercialize advanced mobility technology and business models. It also seeks to be first fully integrated mobility testbed for inland ports. The Mobility Innovation Zone is similar to the planned CSL in that it leverages significant industry and anchor support in the area, and seeks to be a leader in smart logistics infrastructure deployment. The Mobility Innovation Zone may also be a significant competitor for the CSL.

- **Mid-California International Trade District.** The Mid-California International Trade District (MCITD) is located in central California in Merced County, the east and adjacent to Silicon Valley. MCITD is the site of a new development focused on rail and goods movement and facilitating the flow of products along the Burlington Northern Santa Fe Railroad to and from the Port of Los Angeles. The project is in early stages. Much of project's funding to date has come from the State of California, as part of the State's efforts to reduce emissions.

- **DHL Americas Innovation Center.** Opening in the summer of 2019 and based in Rosemont, Illinois, the DHL Innovation Center is a physical space that can "host up to 300 people per day, allowing DHL to exhibit its current logistics technologies, foster the development of future platforms, and support collaboration between DHL customers, technology providers, and academic researchers."[30] It further facilitates collaboration from researchers, customers, and technology

[29] https://www.fraunhofer.org/en/startpage/profile.html
[30] https://www.dcvelocitv.com/articles/20180530-dhl-to-build-logistics-innovation-center-in-chicago-area/

providers; DHL uses these insights to generate product research and pilot projects. Although much of its initial innovation activity appears to be in robotics and drone technology, this center may be a competitor.[31]

- **BNSF Logistic Park Chicago.** This is an on-going effort that originated during the market research for this project that involved engaging with a number of innovators and frontrunners in freight automation. Due to a high level of interest from some of the key local players, a concept proposal for creating a test platform for moving containers between the railyard at BNSF Logistics Park Chicago in Elwood, IL and surrounding facilities within the same development was developed. At the BNSF Logistics Park Chicago, the railyard is near the warehousing facilities which creates a mostly closed loop environment, providing an opportunity to create a test site for AGVs and related technologies relatively easily.

III. Products/Services

The precise products and services developed and/or offered at the CSL will depend on the business model that is validated through additional market research, including direct inputs from potential partners and clients. Described below are the range of products and services that the CSL could develop or offer, as surfaced by the market research to date. It is likely that the additional market research will suggest that the CSL should offer a selection of the following products and services.

A. Products developed at the CSL

Initial research indicates that the CSL could serve to develop and pilot the following technologies:

- Simulating automation of inland port freight systems and intermodal yards freight systems. For example, use agent-based model (ABM) framework to facilitate the design and optimization of "flexible" automated systems that employ semi-autonomous components to enhance resilience against unexpected events
- Connected and automated vehicles and equipment testing interoperability with real-business environment settings
- Automated supply chain integration through data integration
- Automated transfer technologies connecting equipment, vehicles and management tools
- Outlying LIDAR and DGPS management system (immediate geography) integration that enable the communication and connectivity of the equipment

B. Products and services offered at the CSL

The products and services offered will vastly differ depending on whether the CSL takes a passive role by providing a space for digital logistics technology firms to innovate or takes a more active role by participating in or organizing the research and development of the automation technology.

Current theories about the products and services offered include the following:

- **Shared development space.** The CSL may provide a space for autonomous technology component

[31] https://www.logistics.dhl/global-en/home/press/press-archive/2018/new-dhl-americas-innovation-center-to-promote-future-of-logistics.html

developers to co-locate to collaborate and develop their products together.

- **A real in-land port testing environment.** The CSL may provide an environment where autonomous technology component developers can test their equipment before bringing products to market.
- **On-site testing, design and implementation.** The CSL may coordinate and advise on the testing of autonomous technology equipment on client sites.
- **Software simulation.** The CSL may facilitate design and develop environment settings and prototypes to test entire movement flows to help businesses design and improve the equipment.
- **Product integration testing.** The CSL could develop the overall communication and operational management software system to test the product/system integration.
- **Engineering testing.** The CSL may evaluate performance in predefined settings, test the potential capacities of the equipment, and help decide whether products serve certain markets.
- **On-site help.** The CSL may help businesses demonstrate at the site and pursue commercialization.
- **Access to experts.** The CSL may connect autonomous technology component developers with industry experts to further develop products.
- **Connecting buyers and suppliers.** The CSL may provide the means to connect autonomous technology component buyers with suppliers.
- **Data and research.** The CSL may provide data and performance evaluations for academic research and policy implications.
- **Technical expertise.** The CSL could develop sophisticated technical expertise on the offerings of all the suppliers to provide an unbiased evaluation for buyers.
- **Business development.** The CSL could provide space for firms that want to develop businesses to serve the market.
- **Sales center.** The CSL could create a centralized sales center for all suppliers to demonstrate and offer their products to buyers.
- **Training center.** The CSL could train personnel for use of the new technology.
- The CSL could serve as a **buyer** for a group of users to negotiate more attractive deals.

C. Pricing

The pricing plan for products or services rendered by the CSL will be developed in conjunction with the decided products and services, as well as through interviews with firms and what price-point is conducive to moving forward with automation technology development. The pricing will also raise questions about intellectual property, and how the CSL retains a stake in products once they are developed. Initial thoughts on how the CSL could price its services include:

- **Fixed fee.** Equipment suppliers (e.g., AGV, sensors, automated straddle carriers, etc.) and other supply chain businesses, from the railroads to end users, pay a fee to utilize the CSL.
- **Royalties.** The CSL retains a percentage of revenue resulting from products developed at the CSL.
- **Service basis.** Clients pay for specific CSL services, such as policy consulting. For example, CSL could conduct an analysis of relevant rules and regulations related to on-the-road testing of autonomous trucks, and give insights and recommendations into selecting and readying road segments for testing or regulatory changes that will be needed to make it happen.
- **Sale of products.** The CSL charge commissions on the products that have been developed, tested and/or integrated at the Center.

IV. 2-Year CSL Plan – Field Test

A. Field Test Scope and Purpose

The Center for Smart Logistics has developed a partnership with the UIC Center for Transportation and Hanson Professional Services to implement a Business Plan prepared by these partners along with the Southland Development Authority. Our work has concluded that the private sector participants recognize an opportunity to use autonomous tractor terminals to connect intermodal yards with nearby distribution centers, but that the need for coordination with many partners has inhibited the application of these technologies. Thus, CSL proposes to develop a field test for these technologies and build the capability to create similar tests throughout the United States.

Running an autonomous operation between the intermodal yard and the warehouse requires communication and coordination between the two facilities regarding time scheduling and status of the equipment. Lacking such communication and coordination will create many problems, for example, chassis management. For current operations, a container is taken off a train car, loaded on a chassis, and brought to the warehouse behind a tractor. Warehouses commonly treat chassis like trailers and never separate containers from them. This creates scheduling and chassis supply issues within the intermodal yard.

The open, yet limited, public road environment available in Elwood is an excellent opportunity to run a loop between a warehouse and intermodal facility while being able to limit the risk. To quantify the impacts of automation, two types of computer models will be developed. One model is used to determine the broad benefits of autonomous movements of containers and chassis between the intermodal yards and warehouses. Demonstrating via data that the underlying benefits apply to not only users of automation technologies but also society as a whole will be essential to convince both the public and private stakeholders to invest in such a project. Reduction in operating costs, congestion, accidents, pavement damage, and emission of air pollutants and greenhouse gases will be estimated. A different model will be developed to guide the coordination of operations at both intermodal yards and warehouses. The logistics of managing chassis, containers, and tractors at multiple locations will be optimized by combining data supplied by the partners with a state-of-the-art model that uses artificial intelligence and machine learning.

The following partners are needed to get the field test up and running:

- Autonomous Vehicle Manufacturer
- Automated Logistics Firm
- BNSF
- Warehouse
- Illinois Department of Transportation and the Executive Administration
- Village of Elwood

The field-testing program is the preliminary stage of the larger operation of the Center for Smart Logistics. The proposed plan includes two phases. Phase I is developed mainly around the simulation modeling. It includes connecting all stakeholders in the supply chain between the BNSF intermodal yard and the nearby distribution centers, developing models to simulate operational improvements of using autonomous terminal tractors under different scenarios, and estimating the improvement in efficiency via simulation results and cost-benefit analysis. In Phase II, the team will use the testing procedure and designed environment built upon simulation results in Phase I to seek partners and funding for the real field test.

B. Field Test Area Background

The Village of Elwood is a southern suburb of Chicago. The BNSF Logistics Park CenterPoint (LPC), located within the village, sits adjacent to a block of warehouses that are used by both large and small corporations.

Public roads connect the intermodal yard and warehouses, but since the roadways only lead to the industrial uses, non-associated vehicles are rare. The scenario creates an opportunity to test autonomous and connected industrial mobility within an open environment while being able to limit the risk associated with conflicts between the general public and the autonomous vehicles.

Public Infrastructure

The public infrastructure between the facilities is varied which provides ample opportunity to test the effectiveness of autonomous technology.

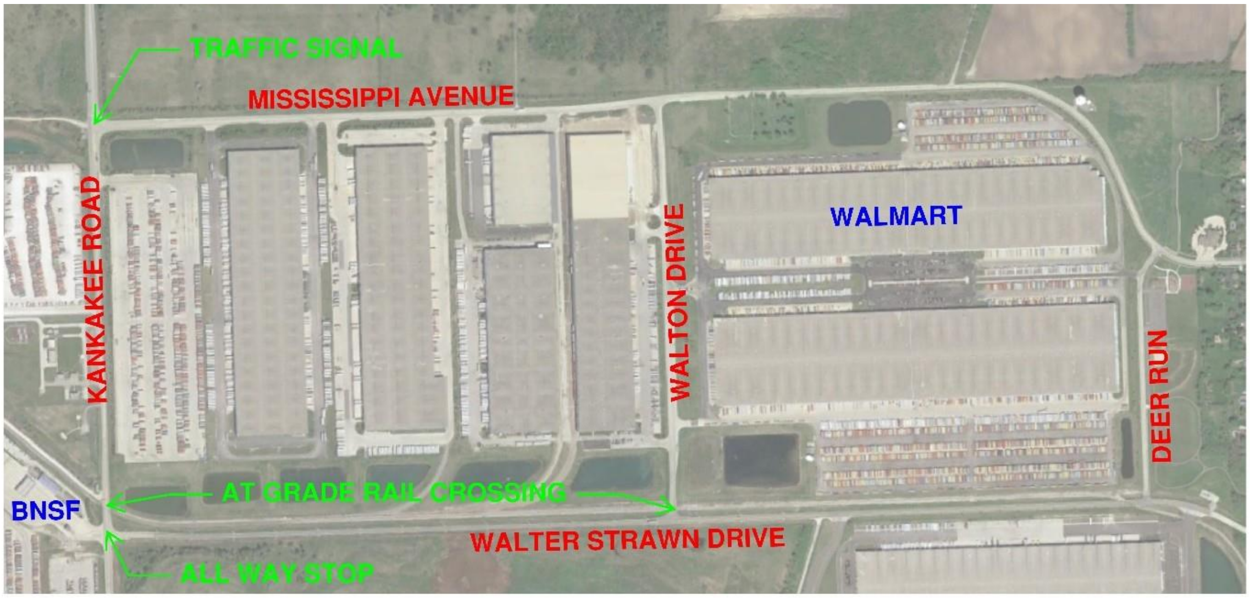
Mississippi Avenue – Mississippi Avenue is a three-lane roadway that runs east west on the north side of the warehouses. A majority of the warehouse entrances are located off of Mississippi Avenue. All entrances are located on the south side of Mississippi Avenue.

Walter Strawn Drive – Walter Strawn Drive is two-lane roadway that runs east-west on the south side of the warehouses. The roadway runs parallel to the BNSF rail line that runs east out of Chicago. There is one warehouse facility located south of Walter Strawn Drive, but the majority of the warehouses are to the north. The rail line separates the warehouses and the roadway, so there are no entrances located directly off Walter Strawn Drive.

Kankakee Road – Kankakee Road is a two-lane road with a wide median that transitions into turn lanes at intersections and access points. Kankakee Road connects LPC and the associated warehouses to County Highway 17 to the north. This roadway is the main access route between I-55 and the industrial uses. Kankakee Road dead ends at the LPC, so through traffic is limited. There is an at-grade rail crossing with gates on Kankakee Road, just north of the BNSF LPC.

Walton Avenue – Walton Avenue is a north-south street that connects Mississippi Avenue and Walter Strawn Drive through the warehouse block. The Walmart warehouses are located east of Walton Drive with the entrances located along the corridor. There is an uncontrolled dual right turn lane into the southernmost entrance to the Walmart Distribution Center. This is an unusual configuration that is not implemented frequently. There are also entrances that access the warehouses on the west side of Walton Drive. This is the only corridor in the section with entrances on both sides of the street. Walton Drive crosses the BNSF rail line on the south end of the corridor.

Intersections – Within the project area, there are examples of three major intersection types. There is a traffic signal at the intersection of Kankakee Road and Mississippi Avenue. There is an all-way stop at the intersection of Kankakee Road and Walter Strawn Drive. There are multiple two way stops at various locations.



C. Proposed Field Test

The proposed field test will create a safe and open ecosystem for smart industrial mobility and secure commitments from interested parties to run a full loop of autonomous vehicles between warehouses and an intermodal facility with the intent of understanding the implications associated with:

- Warehouse and BNSF communications
- Operating on a Public Roadway
- Cost of autonomous vs. driver operated tractor-trailers
- Timeliness of autonomous vs driver operated tractors-trailers,

The proposed loop is shown in the figure below. It can be run clockwise or counterclockwise to test different movements and conflicts associated with a public roadway. To implement the proposed loop, an open source connected vehicle platform will be enabled with either DSRC radios or 5G communications. It is anticipated that approximately 30 communication units, both roadside and within vehicles, will be needed to safely operate a connected and autonomous vehicle on the loop. Testing of autonomous vehicles on public roads will also need to satisfy the conditions set by the IDOT to obtain their approval. Following are activities and assets that will be needed for the proposed test.

Phase I

The Center for Smart Logistics Office at the Chicago Southland Tech Incubator and its partners, UIC Transportation Institute and Hanson Professional Services will collaborate to:

- Develop logistics simulation modeling. These simulations will test operational improvements of various ways of using autonomous terminal tractors under different scenarios as train cars are unloaded and at the queuing locations within the distribution center prior on the efficiencies of intermodal operations and on distribution centers through improved chassis management.
- Develop cost-benefit analysis of autonomous operations, including the estimations of broad benefits for the public and the benefits for the private resulting from improved overall efficiency of intermodal yards and distribution centers.
- Work with IDOT and Will county to develop a testing procedure that will enable the Center to obtain a permit to use public roads for the field test.
- Design a staging area testing environment to load and unload containers onto the chassis to be pulled by an autonomous tractor terminal that allows the CAV delivery trucks to stage without impeding the delivery of other containers inside the intermodal or warehouse.

The CSL will purchase communication software and develop the communication software to enable tractor terminals to communicate with intermodal yards and distribution center and conduct these tests in the staging area.

In additional to that, the CSL team has been engaging with Illinois Soybean Board for a similar project design. The Chicago Southland Economic Development Corporation encourages collaboration opportunities and brings existing relationships with the University of Illinois – Chicago, Governor State University and the Illinois Innovation Network’s Smart Mobility Vertical in Peoria. As a part of that project, the CSL team will collaborate with agricultural producers to find dependable use cases for smart technology networks that are scalable and create competitive logistics advantages with smaller carbon footprints.

Phase II

Seek memberships in CSL from private companies to participate in the testing and fund the field test. The filed test will require the installation of

- A high definition map of the route,
- DSRC or 5G Communication System,
- Purchase an open data platform or AWS account so that the participants in the field test could store and share data,
- An open platform route tracking system,
- Implementation of terminal tractor staging areas
- Further development to update and improve the simulation models developed in Phase I to facilitate the optimization of operations and to determine new technologies or practices needed to improve operations.

Depending on the scope of the field test desired by the partners, the cost of each element described above could vary from the amount provided. A robust data management system may also be required. A fully scaled test could cost $1,000,000, but it is recommended that the field test be completed in phases to reduce funding needs and keep the project moving forward.

After Phase II

In Year 3 and Year 4, the CSL team will recruit new clients to design a customized field test based on their needs. The goal of this 2-year phase is to complete two additional field test and become self-sustain as the Center.

D. Field Test Deliverables

The proposed project will take all the gathered information and create a working group with the intentions of moving the field test forward to implementation. The Center for Smart Logistics will begin to implement phase I by designing the field test and then move to implementing the test in phase II. The goal is for the intermodal yards and the warehouses to recognize enough value in the efficiency that the investments on private property will be completely covered by the private entities. Chicago Southland EDC will act as a broker and develop a detailed proposal that coordinates efforts between private entities and public to maximize use and potential benefits from the autonomous operation. Chicago Southland EDC will seek public sector resources to implement any necessary public infrastructure required to run the autonomous vehicles safely.

A Southland company is developing a product that would allow an autonomous tractor terminal to potentially load or unload a chassis from in staging areas at either an intermodal operation or a distribution center. This product could be an essential part of a staging area.

E. Intellectual Property

The data collected from the field test will be shared with the funding partners. In addition, the CSL will further develop its expertise in automated logistics field tests and will seek to implement similar tests in other parts of the country. CSL may determine a need for new technologies to improve these operations and will seek to develop this technology for other future applications.

V. Business Model

The market research to date suggests that there are several business models that the CSL could pursue. Each model addresses a different market gap and point in the supply chain for digital logistics technology, although the listed models are not mutually exclusive.

- **Model 1. Primary Focus in the 2-year field test - Collaborative, industry-driven testing and development center**. In this model, the CSL would coordinate different firms that are related to the development of digital logistics technology components. In the case that the relevant components to develop the technology exist but lack a cost-feasible way to synergize in order to bring a product to market, the CSL could develop and implement testing plans to enable products to communicate, connect, and integrate to all system elements. For example, the CSL could work with software and AI companies to develop an overall communication and operation management system, including software and censors. The software testing and development could be hosted at a downtown space, such as the Discovery Partners Initiative (DPI) at UI. Additionally, in the case that certain components of the digital logistics technology do not exist, the CSL could lead product development and prototyping of the components. The firms would collaborate on developing and prototyping the new AGV technology, sharing the overall cost. The CSL would engage with related firms to bring those products into existence. The product development, testing, and prototyping can be done in the Southland.

- **Model 2. Gradually Developing after the phase I of the field test - Consultancy.** In this model, CSL advises on the integration and communications of different software, hardware, and operating systems in intermodal yards and surrounding development. The CSL could also provide policy analysis capacity, as some firms are familiar with the technology side of the product development but lack the capacity to design a testing site. The CSL will help build in-depth policy analysis focusing on the areas or the roads that the firms require.

In the first two-year field testing, the CSL will adopt the model 1 Collaborative, industry-driven testing and development center and keep the opportunity open for the model 2 Consultancy, but the main focus during the field testing won't be the development of the consultancy. Using the expertise and experiences the team built in the field test, the CSL will be able to sell the integration services developed from the test to other similar yards. After the TDL sector in southland fully digitalized, the CSL would provide consulting services to intermodal yards outside of the Southland.

As the CSL starts to operate the field test with partners, additional data from the test results, market engagement, and discussions with industry leaders involved will guide the development of the final optimal business model for the CSL.

VI. Customers

Market research suggests that are two types of customer for the CSL to consider: customers looking to innovate and develop at the CSL and customers looking to purchase products and services offered at the CSL. Demand for products and services will drive demand for the means to develop those products and services.

The customer and market share needs to be further determined through the two-year field test, as customer needs will inform the overall strategy. Below is the range of potential customers that the CSL could pursue according to the market research to date. Specific firms of interest are also noted when they expressed willingness to participate in the proposed two-year field test.

AGV Suppliers

- **Logistics equipment suppliers.** This includes firms that have or are developing automation technology equipment that want to find their customers and want to develop or improve their equipment. These customers may want to save money by co-developing or may need to integrate their technology to successfully develop their product. They may also be suppliers who want the space to develop their products to be used by people developing products.
  - *Firms*: Orange EV builds electric hostlers in Missouri and is collaborating with Outrider. Orange EV may be interested in locating customers or developing and improving their equipment through the CSL. They would also save money by co-developing and possibly integrating their technology with partners/clients to successfully develop their product. There may also be suppliers who need the space to develop and test their products. Mi-Jack Products is a worldwide leader in automating inland ports and could be a leader in integrating their products**.** Kalmar is a firm that provides products and services to ports, terminals, distribution centers and heavy industry. Specifically, Kalmar is a leader in terminal automation, specializing in process and equipment automation, as well as the computer systems that facilitate automation. These firms are actively engaged in the development of automated equipment, and they expressed an interest in having a test site to pilot and demonstrate their products and also advance system integration with other components, both soft and hard.

- **Logistics software technology suppliers.** This includes firms that are developing automation technology that may not already be working in the logistics industry. These customers may want to expand their product offering and available markets, but don't know how to break into the mature TDL industry. They also may not fully understand the demands of their customers in this market.

- *Firms*: Outrider and AutonomouStuff are developing autonomous software to work with hostlers, including those are electric. These firms would benefit from having access to CSL to set up testing sites to involve their software.

AGV Users

- **Intermodal logistics centers.** Firms who want to adapt their system with digital automation technology to increase efficiencies or total volume of cargo handled.
  - *Firms*: Hillwood, Centerpoint, and Northpoint are world-class developers of logistics parks located near intermodal centers. All see the use of AGVs in the parks as offering a competitive advantage. Northpoint Development is developing an intermodal site for BNSF, and has already considered developing a testing center in Kansas City, where it's headquartered. Northpoint is very interested in integrating AGV technology in the BNSF site.

- **The warehousing industry.** Firms that operate large distribution centers may want autonomous or digital technology to move goods between outside facilities, including inland ports, and the warehouse. Currently, they are using trucks. Using AGVs could make the warehousing industry cleaner, and lessen the spatial footprint, making it easier to locate in a dense urban environment near their customers.
  - *Firms*: In an interview with Amazon, they expressed interest in collaborating with CSL after their next round of sites are confirmed. Also, at Mobility Innovation Zone in Texas, railroads and retail businesses are collaborating to develop and test such technology. They have expressed an interest in CSL, which offers different physical, climatic, and regulatory environment.

- **Other intermodal centers that could benefit from advanced technologies.** As noted earlier, not all railroads and developers have capabilities to automate. However, in the long run, they will be forced to adopt automation to remain competitive. CSL can provide an opportunity for those to catch up with early adopters by offering experience-based advice and services.
  - *Firms*: The UP and CNN rail companies understand that they are behind the development work at BNSF. They have said they would like to better understand the technology and are willing to continue conversations with us.

VII. Operational Plan

The operational plan of the proposed two-year field test will take shape once the business model, products and services, and customers are determined. At that point, the CSL's governance, staffing, and implementation activities will also need to be established. A marketing or recruitment plan will also need to be developed once customers are identified.

Field Test Workplan – Phase I

Activities	Time	Task Owners	Outputs
Continuous improvement of participating members' knowledge of equipment and testing area	Month 1-4	CSEDC, Hanson, UIC	Identify the appropriate segments of roadways, facilities, equipment that will form the field test
Plan the supply chain flow of the field test	Month 1-4	All participants	
Clarify the regulations on the roads in the testing area	Month 1-4	CSEDC and UIC	
Discuss the equipment required	Month 1-4	All participants	
Reach out to IDOT which helped to pass an Executive Order 2018-10 on Connected and Autonomous Vehicles Testing in the State of Illinois, as well as to the Illinois Automated Vehicle Association (IAVA) to engage them throughout the test design	Month 3-5	CSEDC and UIC	Review all the selected elements to get into the simulation model
Develop logistics simulation modeling	Month 4-10	Hanson, with help from the CSL team and other participants	Simulations will test operational improvements of various ways of using autonomous terminal tractors under different scenarios

Design the cost-benefit analysis framework	Month 5-6	UIC, with help from the CSL team	The cost-benefit analysis framework to move forward
Use the framework developed to conduct cost-benefit analysis of autonomous operations	Month 6-12	CSEDC, Hanson, UIC	Provide estimated benefits from the improved operations to the private firms and the public
Work with IDOT and Will county to develop a field test procedure	Month 6-12	CSEDC, UIC	A testing procedure that will enable the Center to obtain a permit to use public roads for the field test
Business development planning to recruit more clients for the real field test	Month 10-12	CSEDC, with help from Hanson and UIC	A detailed business development plan and a marketing plan for the field test
Design a staging area testing environment	Month 6-12	Hanson, UIC	Finish environment design for the real field test

Field Test Workplan – Phase II

Activities	Time	Task Owners	Outputs
Design a membership development plan	Month 1-2	CSL team	Participants Recruitment
Continue to reach out and recruit private companies to participate in the	Month 1-3	CSEDC	
Purchase the needed equipment	Month 1-4	Hanson	Preparation to start the field test
Engage equipment from private participants in the test	Month 1-4	CSEDC	
Set up the test area and test environment	Month 3-6	CSL team	
Implement the staging area design	Month 2-6	CSL team	
Start the integrated field test	Month 6-11	CSL team and participants	Collect data and test results for further performance evaluation and analysis
Analyze the collected data	Month 7-13	UIC and Hanson	Develop performance evaluation framework
Further development to update and improve the simulation models developed in Phase I	Month 11-13	Hanson, UIC	Improve simulation models
Adjust the field test procedure	Month 11-13	CSEDC, Hanson, UIC	Improve procedure based on real test
Business development planning to recruit clients for the next field test	Month 8-13	CSEDC, with help from Hanson and UIC	Adjust the next test based on clients

The CSL team will continue to explore the applications and integrations of the new technologies during the development of the phase I and phase II, and use the results from the advanced technological design and the real test improvements to adjust the field test and attract new clients to participate in the next round of the field test. After the phase II, the CSL team plan to double the size of the current planned field test. In Year 3 and Year 4, the CSL will design and implement the customized field integrated test for 2-3 intermodal yards.

Contingency Plan			
Risk	Probability	Preparation & Response	Impact
Funding Failure	Medium	The CSEDC and Hanson has secured $25,000 from Illinois Soybean Board to design a similar automation test in the yard. Results from that work will help the CSL team ask for more funding.	High
Core Equipment Failure	Low	All listed potential participants of the field test - phase I are willing to participate. The CSEDC will continue to cultivate relationship with them and engage them with the field test design while seeking funding.	High
Technical Difficulties in the modeling developing	High	The CSL team will bring the Peoria Innovation Hub as an advisor in the phase I. Outriders and AutonomouStuff are very experienced in the developing phase. They would help if the CSL team need technical assistance.	Low
Regulatory Compliance Problem	Low	The CSL team will engage IDOT and ILAVA to make sure the field test is designed with permits.	High
General Execution problem	Low	The CSL team will work with the advisory committee to mitigate the risk.	High

VIII. Financial Plan

The initial financial support for the first year of the field test would come from public grants. The team is looking for other funding opportunities that promote innovation and entrepreneurship, specifically the new EDA CARES Act innovation and entrepreneurship challenge that will be released soon. Once the CSL starts to operate with members, the team will thus generate revenues to invest in additional value-added services. The CSL team is cultivating relationship with private autonomous manufacturers and its team in Southland and seeking opportunity to design a more customized program to generate revenues.

Phase I - First Year of the Field Test		
BUILDINGS/REAL ESTATE		**AMOUNT**
Office Space at 4343 Lincoln Highway	$	5,000.00
Office Space at UIC	$	10,000.00
Office Space at Peoria	$	10,000.00

Total	**$**	**25,000.00**
Capital Equipment list		**AMOUNT**
Communication Software	$	25,000.00
Modeling software and data storage servers	$	25,000.00
Open Platform Route Tracking System	$	25,000.00
Staging area preliminary testing equipment rental	$	25,000.00
Total	**$**	**100,000.00**
Staff Operational		**AMOUNT**
CSEDC Staff	$	25,000.00
UIC Staff	$	75,000.00
Hanson Professional Services	$	75,000.00
Total	**$**	**175,000.00**
Total	**$**	**300,000.00**

SOURCES OF CAPITAL	**AMOUNT**
EDA Grant or DCEO Grant	$125,000.00
UIC Grant	$150,000.00
IL Soybean Board	$25,000.00
Total	**$300,000.00**

Phase II – Second Year of the Field Test		
BUILDINGS/REAL ESTATE		**AMOUNT**
Office Space at 4343 Lincoln Highway	$	5,000.00
Office Space at UIC	$	10,000.00
Office Space at Peoria	$	10,000.00
Total	**$**	**25,000.00**
Capital Equipment list		**AMOUNT**
A high definition map of the route	$	50,000.00
DSRC or 5G Communication System	$	200,000.00
Purchase an open data platform or AWS account	$	25,000.00
An open platform route tracking system	$	50,000.00
Implementation of terminal tractor staging areas	$	600,000.00
Total	**$**	**925,000.00**
Staff Operational		**AMOUNT**
CSEDC Staff	$	50,000.00
UIC Staff	$	100,000.00
Distillery Labs (Peoria IIN Hub) - Smart Mobility Vertical	$	100,000.00
Total	**$**	**250,000.00**
Total	**$**	**1,200,000.00**

SOURCES OF CAPITAL		
Column1		**AMOUNT**
EDA Grant or DCEO Grant	$	600,000.00
Payments from Users	$	600,000.00
Total	**$**	**1,200,000.00**