

STATEWIDE ECONOMIC IMPACT STUDIES OF FLORIDA'S TARGET INDUSTRIES

VOLUME 01: MODELING, SIMULATION & TRAINING

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THE FLORIDA HIGH TECH
CORRIDOR

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There is no question that the various aspects and variations that manifest the Modeling, Simulation & Training industry cluster in Florida comprise one of the most vital and interesting economic forces in the United States – and, in fact, across the entire globe. The many faces and uses of simulation training are built on a foundation of research and computer modeling that has infiltrated almost every facet of daily living and business achievement. Whether you are a soldier, a video gamer, a film producer, a medical student, a pilot, a fashion designer, an engineer, an astronaut, or an astronomical observer – you would be hard pressed to complete your mission without depending on modeling, simulation and training. Not only has this innovative industry cluster grown in depth over the past two decades, it has also grown in breadth, reaching into almost every field of endeavor known to man and business and education.

This phenomenon has not gone unnoticed in the institutions of higher learning and research. This ever-emerging industry cluster has been observed and studied frequently for its significance. Because of its broad and far-reaching character, however, ascertaining its total impacts on society and the economy can be challenging. Thoughtful research must identify the components of larger, traditional industry sectors in order to isolate those activities directly related to evolving MS&T technologies. In the analysis prepared by Dr. Vernet Lasrado and summarized in this report, he has gone to great lengths to isolate specific MS&T employment categories among broad industry sectors and within certain companies that contribute to the productive use of MS&T technologies. Similar analytic efforts in 2008 and 2012 provided a basic template for establishing

employment figures, which could then be used in state-of-the-art input-output models to calculate the total impacts of modeling, simulation and training throughout the state of Florida with respect to employment multipliers, economic output, and the generation of state, local and federal taxes, and other fiscal benefits. This consistency of approach gives continuity to the evaluation of these impacts over the past several years.

As one reviews the results of the statewide impact analysis summarized in the pages of this report, it becomes undeniably clear that MS&T is an industry cluster that is here to stay, not only in Florida, but also across the globe. Even during the past several years – which have been as economically challenging as any period since the Great Depression of the 1930s – the MS&T cluster has continued to expand and flourish. Much of the remarkable technological advancement that we enjoy today had its roots here in Florida. Florida will continue to benefit greatly as the “hub” of this powerful and pervasive economic force for enhancement and strengthening of our lives, our jobs, our entertainment and communication, our education, and our defense systems.



Florida is home to the world's largest Modeling, Simulation & Training (MS&T) cluster, encompassing companies that provide virtual, augmented and mixed reality training for defense, medical, education and commercial purposes. This study quantifies the economic impact of the MS&T industry in the state of Florida for the year 2015.

MS&T has a tremendous economic impact on Florida.

The sector directly employs more than 30,000 jobs with an average annual salary of approximately \$78,341¹. In 2015, the MS&T sector contributed more than 73,802 total² jobs to Florida's economy, more than \$6 billion to Florida's regional GDP, and more than \$11.6 billion in state sales (economic output) activity.

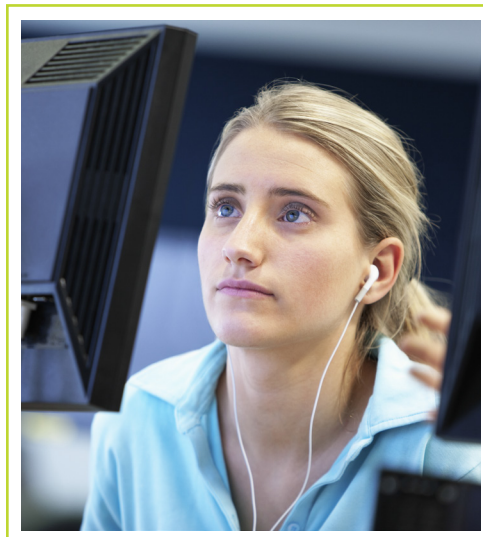
For the year 2015, the detailed estimated impacts of the MS&T sector are presented below:

1. The sector sustained 73,802 total jobs in Florida.
 - a. The direct effect of the activities resulted in 30,236 jobs sustained with an average annual salary of \$78,341.
 - b. The indirect effect of the activities resulted in 18,929 jobs sustained with an average annual salary of \$53,211.
 - c. The induced effect of the activities resulted in 24,637 jobs sustained with an average annual salary of \$43,414.
2. The sector generated more than \$11.6 billion in total sales in Florida.
 - a. The direct effect of the activities resulted in more than \$5.66 billion in sales.
 - b. The indirect effect of the activities resulted in more than \$2.56 billion in sales.
 - c. The induced effect of the activities resulted in more than \$3.38 billion in sales.
3. The sector generated more than \$6 billion in total regional GDP in Florida.
 - a. The direct effect of the activities resulted in more than \$2.66 billion in regional GDP.
 - b. The indirect effect of the activities resulted in more than \$1.43 billion in regional GDP.
 - c. The induced effect of the activities resulted in more than \$1.91 billion in regional GDP.
4. The sector generated total state and local taxes of more than \$354 million, while also generating more than \$1 billion in federal taxes.

Florida MS&T is a unique, critical national knowledge and innovation resource that is the result of more than 70 years of growth and evolution. Almost

every soldier recently deployed overseas has been trained on systems developed in Florida. These systems have helped U.S. soldiers to be better prepared than ever before, resulting in the lowest levels of reported injuries and casualties than in any prior engagement. Companies from across the U.S. invest in Florida MS&T research, attend Florida MS&T activities, and leverage Central Florida as a "hub" for developing business networks and developing critical technology partnerships³.

Florida MS&T makes a critical contribution to military readiness and effectiveness across the United States. This contribution represents a critical and unique national asset and capability that developed over



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the course of 70 years, and cannot be easily replaced or relocated. MS&T technologies are lower-cost solutions to expensive legacy, hardware-intensive platforms, and are increasingly driven by private-sector innovation and competition versus proprietary military technologies. New soldiers expect to be trained in MS&T environments, and to have access to ubiquitous, on-demand information and training. Private-sector medical simulation technology is just beginning to gain momentum, and has potential to eclipse military MS&T in demand and growth. As other U.S. regions suffer from BRAC closures and non-MS&T procurement budgets decline, Florida MS&T faces increasing pressure from competitors to evolve and not lose its key resources.

Florida's MS&T cluster supports not just the military MS&T cluster, but also other growing

industry clusters that are built on complementary technologies and specialized workforces, i.e., digital media, entertainment, gaming and medical simulation. The overlap among these clusters drives innovation and growth to the benefit of each⁴.

While this report and the analysis it summarizes focuses on Florida statewide impacts, the contributions of Florida's MS&T industry cluster to defense, medical and entertainment industries throughout the United States and the world should not be overlooked or minimized. Simulation and modeling has applications across almost every academic discipline and industry sector. However, Florida's particular niche focuses on training and education, and it has particular strength in aviation, aerospace, military and emergency simulation, and modeling technologies.



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This work builds upon a series of prior reliable economic impact studies that circumscribe the estimated economic impacts of select industries in the state of Florida. In this study, we look at the Modeling, Simulation and Training (MS&T) cluster in Florida. Florida is home to the world's largest MS&T cluster, encompassing companies that provide virtual, augmented and mixed reality training for defense and commercial purposes.

This study quantifies the economic impact of the MS&T industry in the state of Florida for the year 2015. This report was commissioned by Enterprise Florida through support from the Florida High Tech Corridor Council Inc. The following historical background of Florida's MS&T industry in part is repeated from a research report prepared by Tucker Hall for the Florida High Tech Corridor Council released in September 2012⁵.

A BRIEF HISTORY OF FLORIDA'S MS&T CLUSTER

Industry experts believe that the global simulation and training industry had its start in 1929 with the development of the "Link Trainer." Although it increased in complexity, this simple mechanical device largely remained one of the few flight simulators for training pilots until the 1960s. An early successor to the Link Trainer – the Navy PBM trainer – was built at Banana River, Florida, in 1943, by Bell Laboratories.

Like many of Florida's other technology industries, the MS&T cluster owes much of its development to the state's defense and aerospace industry and the long-standing presence of key military installations. By the late 1940s, a few key U.S. military bases were established in Florida to support the growing national need for aerospace control, guidance and tracking systems, particularly in the development of weapons systems. This included the McCoy Air Force Base, which was a training base located near Orlando that had significant responsibilities during the Vietnam War and the Cold War period (1940-1947, 1951-1975).

In 1949, an interagency agreement was signed between the U.S. Army and Navy to establish the

Naval Training Device Center (NTDC) and the Army's PMTRED operations. The Air Force and the Marines joined the NTDC in the late 1960s, and in 1968, the Naval Training Center Orlando was also established (1968-1993).

By the 1960s, the U.S. military's training needs became much more complex with the addition of air defense systems, helicopters and the integration of computer electronics into almost every type of military equipment. With these developments, simulation and training solutions became increasingly necessary and cost-effective, and the simulation and training industry became firmly established.

By 1975, the Naval Training Systems Center (NTSC) was established, which attracted companies such as General Electric (at Daytona Beach), Scientific Applications International Corporation (SAIC), and Link (which later became Raytheon/E-Systems). GE originally developed visual systems to support the Apollo Lunar programs at Cape Kennedy; later, GE focused on visual systems and consolidated operations in Orlando. Their business units were eventually acquired by Rodan and Martin Marietta (now Lockheed Martin).

In 1988, the Naval Support Activity (NSA) Orlando was established as the home of the Naval Air Warfare Center Training Systems Division Orlando (NAWCTSD). NAWCTSD Orlando is the Navy's principal center for modeling, simulation and training systems technologies. The Center provides training systems development for a wide spectrum of military programs, including aircraft, surface ships, submarines and other specialized requirements. Today, NSA Orlando provides support to all Department of Defense activities in Central Florida, most of which support military training and simulation missions. It has added the U.S. Army's Program Executive Office for Simulation, Training and Instrumentation, the Army's equivalent to NAWCTSD Orlando, as a major tenant unit.

Also in 1988, the University of Central Florida (UCF) helped establish the NTSC outside of the naval base through the formation of its Institute for Simulation and Training (IST). The inter-agency presence in

Orlando, in conjunction with the fact that the NTSC was well-funded, but understaffed, allowed many small companies to establish and build up quickly to fill the military's need. The majority of these companies were created by retired military personnel and previous employees of such companies as Raytheon, Lockheed Martin Information Services and SAIC.

In 1993, the National Center for Simulation (NCS)⁶ was formed as the link among the defense industry, government and academia on behalf of the entire modeling, simulation and training community. Also in 1993, NTSC becomes the Naval Air Warfare Center - Training Systems Division.

In 1996, the Air Force Agency for Modeling and Simulation is set up as the executive agent for the Air Force Modeling and Simulation Training Toolkit (AFMSTT). AFMSTT is an aggregate set of computer simulation models and support tools used to facilitate the training of senior commanders and their battlestuffs in the execution of joint and combined operations.

In 1999, the Joint Advanced Distributed Learning Co-Lab is established in Orlando. This initiative is the Department of Defense research and development epicenter for learning science and technologies, and serves as the thought leader for facilitating learning for our nation's warfighters, government agencies and beyond.

In 2001, the Program Manager for Training Systems (PM TRASYS) was relocated to Orlando from Quantico. It serves to improve the warfighting effectiveness of the Marine Air-Ground Task Force and globally deployed maritime expeditionary forces by providing training support, and developing and sustaining training systems and devices. Also in 2001, the UCF Partnership Building 1 is completed. It is shared by UCF and the U.S. Department of Defense in the Central Florida Research Park that supports the nation's military personnel and the state's modeling and simulation industry center of Orlando. Partnership I was such a huge success that another state-supported opportunity for more advanced construction led IST to design and build the Partnership II (in 2004), Partnership III buildings (in 2010), and as of March 2016 more than \$43 million

has been budgeted for Partnership IV. Today, these buildings are home to UCF's Institute for Simulation and Training, and the Modeling and Simulation acquisition components of the U.S. Army and U.S. Marine Corps.

In 2002, the U.S. ARMY STRICOM (Simulation, Training & Instrumentation Command) is reorganized as U.S. ARMY PEO STRI whose mission is to develop, acquire and sustain simulation, training, testing and modeling solutions to achieve army readiness. The PEO STRI aims to be the provider of choice for adaptive training and testing environments to optimize soldier performance.

In 2004, the Federal Law Enforcement Training Center (FLETC) Orlando team, located in Orlando, Florida, evaluates new and existing training technologies for their ability to meet law enforcement training needs. Forging partnerships with the Army, Navy, Marine Corps and Air Force for training and simulation systems, the University of Central Florida, and industry throughout the United States ensures that FLETC is aware of the current state of technology and technology integration within those markets.

In 2005, Florida Interactive Entertainment Academy (FIEA) opened in Downtown Orlando. It was a novel collaboration in which UCF provided the instructors and the students, the City of Orlando gave land and a building, video game leader Electronic Arts invested to build elite facilities and student programs, and state lawmakers secured other funding. Currently, it is ranked #1 by *The Princeton Review* and *PC Gamer* magazine for being the best video game graduate school in North America. Also in 2005, the Nicholson Center at the Florida Hospital is opened. The center is a model for open collaborations to advance practices and standards across the entire spectrum of minimally invasive, laparoscopic, robotic, telemedicine and medical simulation. It is a place where students, educators, industry, researchers, clinical organizations and even the U.S. military come together,

In 2006, the U.S. Air Force Training Systems Product Group (TSPG) joined Team Orlando⁷. TSPG is an umbrella term used to describe the Air Force organizations that support warfighter training

through the use of modeling and simulation techniques. Collectively, the TSPG provides the warfighter with a full range of training system lifecycle support. Also in 2006, the Joint Training Integration and Evaluation Center was established at Team Orlando with the aim of coordinating human performance/training solutions between the Joint and Other Government Agency communities on behalf of Team Orlando.

In 2009, the Acting Under-Secretary for Health authorized the establishment of a national simulation training and education program for the Veterans Health Administration. Dubbed the “Simulation Learning, Education and Research Network,” or SimLEARN, the program is set up to improve the quality of health care services for America’s veterans through the application of simulation-based learning strategies to clinical workforce development.

In 2012, the Center for Advanced Medical Learning & Simulation (CAMLS) is set up at the University of South Florida. The CAMLS facility provides a state-of-the-art, clinical environment dedicated to surgical skills labs, operating suites, a virtual hospital and simulation center. Likewise, UCF, the University of Florida and the University of Miami have extensive training via simulation embedded in their respective medical programs.

In 2013, the Mayo Clinic in Florida added a state-of-the-art simulation center where multi-disciplinary teams can use advanced medical simulation to provide interactive, hands-on training that enhances the safety of the patients and staff.



The remainder of this report discusses the methodology used and presents the outcomes of the current study.

Florida’s MS&T cluster supports not just the military MS&T cluster, but also other growing industry clusters that are built on complementary technologies and specialized workforces, i.e., digital media, entertainment, gaming and medical simulation. The overlap among these clusters drives innovation and growth to the benefit of each⁸. Simulation and modeling has applications across almost every academic discipline and industry sector. However, Florida’s particular niche focuses on training and education, and it has particular strength in aviation, aerospace, military and emergency simulation, and modeling technologies.

The following section presents the methodology used to estimate the number of jobs in the MS&T industry sector.

2.1 MS&T STUDY OUTLINE

Florida MS&T is a unique, critical national knowledge and innovation resource that is the result of more than 70 years of growth and evolution. Almost every soldier recently deployed overseas has been trained on systems developed in Florida. These systems have helped U.S. soldiers to be better prepared than ever before, resulting in the lowest levels of reported injuries and casualties than in any prior engagement. Private-sector medical simulation technology is just beginning to gain momentum, and has potential to eclipse military MS&T in demand and growth. Companies from across the U.S. invest in Florida MS&T research, attend Florida MS&T activities, and leverage Central Florida as a “hub” for developing business networks and developing critical technology partnerships⁹.

As previously noted, Florida’s MS&T cluster supports not just the military, but also other growing industry clusters that are built on complementary technologies and specialized workforces, such as digital media, entertainment, gaming and medical simulation. The overlap among these clusters drives innovation and growth to the benefit of each sector. Simulation and modeling has applications across almost every academic discipline and industrial sector. Simulation is used for semiconductors and manufacturing, for medicine and economics, for geology and hydrology, for networks and software, and for many types of design and entertainment applications. However, Florida holds a particular niche that focuses on experiential modeling and simulation for the purposes of training and education. Florida’s MS&T cluster also has a particular strength in:

- Aviation and Aerospace
- Defense and Military
- Media and Entertainment
- Medical and Health
- Emergency Simulation
- Modeling Technologies
- Education and Training

In essence for the MS&T industry sector for 2015, this study estimates the economic impact of the activities

of all the firms in this industry in the state of Florida. These economic impacts¹⁰ are reported in the form of direct impact, indirect impact and induced impact. The following section details the constraints of the study, the assumptions made, the data collection endeavor and the analysis technique.

2.2 CONSTRAINTS OF THE STUDY

2.2.1 TYPE OF DATA MODELED

In general, for each industry for a given study period data is collected on employment counts in federal government, state government, local government and private firms in the state of Florida. Further information is also collected on the payroll amounts for each industry for the study period.

2.2.2 STUDY PERIOD

The study period models the economic impact of the activities of all the firms in this industry in the state of Florida for 2015.

2.2.3 STUDY AREA

The study area modeled is the state of Florida.

2.2.4 SOFTWARE USED

This current study uses IMPLAN version 3¹¹. The use of IMPLAN reflects the general trend toward its application by multiple departments across the state, thereby leading to a more standardized output across the reports generated. IMPLAN continually updates the data used for modeling the economic impact to reflect more accurately current market conditions. In this study, we use the most recent data update, i.e. 2014 IMPLAN data, released by IMPLAN in December 2015.

2.3 DATA COLLECTION AND ASSIMILATION

The MS&T industry does not have any dedicated North American Industry Classification System (NAICS) codes, but is composed of portions of other industries as described earlier. The state of the MS&T industry in Florida in prior years was captured in 2008 and 2012¹² reports prepared by Tucker Hall regarding the state of the MS&T industry in Florida. Using the same methodology employed in the 2012

report, we updated estimates for the MS&T industry to reflect the state of the industry in 2015.

We build the input data using the quarterly census of employment and wages from the first quarter of 2015 for the industry groups presented below. We use a linear combination of the employment in the following five industry groups to estimate the portions of these industries that contribute to the MS&T employment for Florida:

- Engineering Services
- Scientific Research and Development Services
- Advanced Manufacturing
- All Other Professional and Technical Services
- Business, Computer and Management Training

TABLE 2.1

ESTIMATE OF MS&T JOBS IN FLORIDA FOR 2015

MS&T Employment Within	2012 Jobs	2015 Jobs
Advanced Manufacturing	8,037	7,978
Engineering Services	15,532	18,105
R&D Physical, Engineering and Life Sciences	622	831
All Other Professional Scientific	541	1,001
Advanced Training	2,327	2,321
Total	27,059	30,236

As it can be seen, in 2015 there are 30,236 estimated as direct MS&T jobs in Florida. For 2012 and 2015, the actual number of jobs in these broad industry sectors totals more than 95,000 and 115,000 respectively. Given the lack of dedicated MS&T NAICS codes, the number of jobs has to be estimated from larger industry sectors that have firms deeply involved in the MS&T industry.

2.4 ANALYSIS

The input data collected is compiled and formatted so as to be entered into IMPLAN. Then, an impact scenario is created for each NAICS industry to model the impact of the firms associated with a particular industry in Florida. As a result, multiple scenarios are analyzed and aggregated together to form the outcomes that represent the economic impact of the MS&T sector in the state of Florida for 2015. IMPLAN v3 gives reliable estimates of jobs sustained, regional sales, total economic output generated, state and local taxes generated, and federal taxes generated.

The following section presents the outcomes of the study.

3.1 PRIOR MS&T IMPACT STUDIES

Two prior studies have been completed, in 2008 and 2012 respectively, regarding the MS&T cluster in Florida. In 2008, an analysis of the economic impacts of Florida’s MS&T cluster was released under the report “Florida’s Modeling, Simulation and Training Cluster.” In 2012, a similar analysis performed by the same researchers was released under the report “Impacts of Florida Modeling, Simulation and Training.” Both reports were completed by Tucker Hall under contract to the Florida High Tech Corridor Council.

TABLE 3.1 PRIOR STUDY FINDINGS*

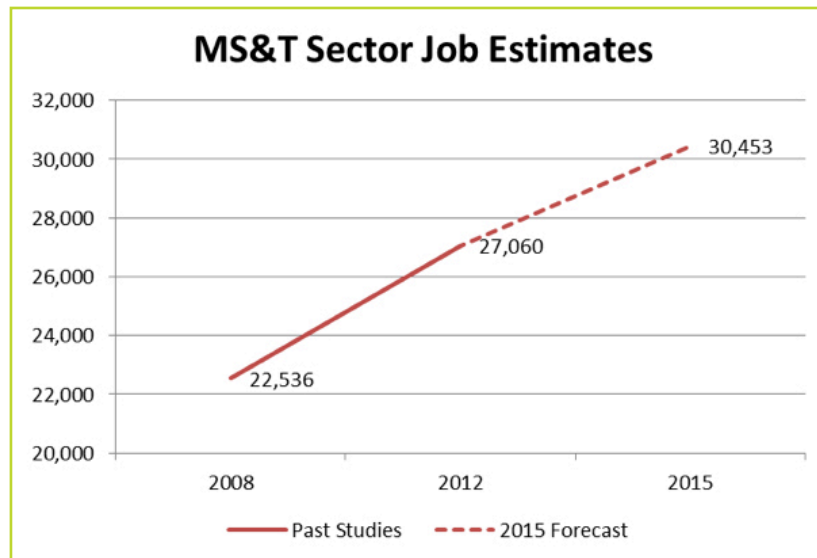
Study Year	Direct Jobs	Total Jobs	Labor Income	GDP	Output/Sales
2008	22,536	53,060	\$3.33	\$4.69	\$8.14
2012	27,060	60,754	\$3.44	\$5.00	\$8.32

*Dollar amounts are in billions

Given the direct jobs in 2008 and 2012, one can develop a preliminary estimate of the jobs in 2015 using standard forecasting techniques. As it can be seen below, it is estimated that in 2015 there would be 30,453 jobs in the state given constant (linear) growth.

Building upon the 2012 study, the current study concludes that as of the first quarter of 2015 the MS&T sector directly sustains 30,236 employees in Florida with an average salary of \$78,341. The current estimate is reasonable and defensible in comparison to the 30,453 forecast developed using 2008 and 2012 data sets.

FIGURE 3.1: 2015 FLORIDA MS&T FORECAST



3.2 CURRENT STUDY RESULTS

3.2.1 JOBS SUSTAINED

As indicated by Table 3.2, it is estimated that the total activities of the firms in the MS&T industry have sustained 73,802 total jobs in Florida in 2015. The direct effect of the activities of the firms modeled in this industry resulted in 30,236 MS&T jobs sustained with an average annual salary of \$78,341. The indirect effect of the activities of the firms modeled in this industry resulted in 18,929 jobs sustained with an average annual salary of \$53,211. The induced effect of the activities of the firms modeled in this industry resulted in 24,637 jobs sustained with an average annual salary of \$43,414.

TABLE 3.2: ESTIMATE OF FULL-TIME JOBS SUSTAINED AS A RESULT OF STATEWIDE INDUSTRIES

Industry	Direct Effect	Indirect Effect	Induced Effect	Total Effect
MS&T	30,236	18,929	24,637	73,802

3.2.2 REGIONAL SALES IMPACT

As indicated by Table 3.3, it is estimated that the activities of the firms in the MS&T industry have generated a total of more than \$11.61 billion¹³ in sales in Florida in 2015. The direct effect of the activities of the firms modeled in this industry resulted in more than \$5.66 billion in sales. The indirect effect of the activities of the firms modeled in this industry

resulted in more than \$2.56 billion in sales. The induced effect of the activities of the firms modeled in this industry resulted in more than \$3.38 billion in sales.

TABLE 3.3: REGIONAL SALES IMPACTED BY ACTIVITIES OF STATEWIDE INDUSTRIES

Industry	Direct Effect	Indirect Effect	Induced Effect	Total Effect
MS&T	\$5,665,602,771	\$2,569,697,490	\$3,380,610,883	\$11,615,911,144

3.2.3 REGIONAL GDP GENERATED

As indicated by Table 3.4, it is estimated that the activities of the firms in the MS&T industry have generated a total of more than \$6 billion¹⁴ in regional GDP in Florida in 2015. The direct effect of the activities of the firms modeled in this industry resulted in more than \$2.66 billion in regional GDP. The indirect effect of the activities of the firms modeled in this industry resulted in more than \$1.43 billion in regional GDP. The induced effect of the activities of the firms modeled in this industry resulted in more than \$1.91 billion in regional GDP.

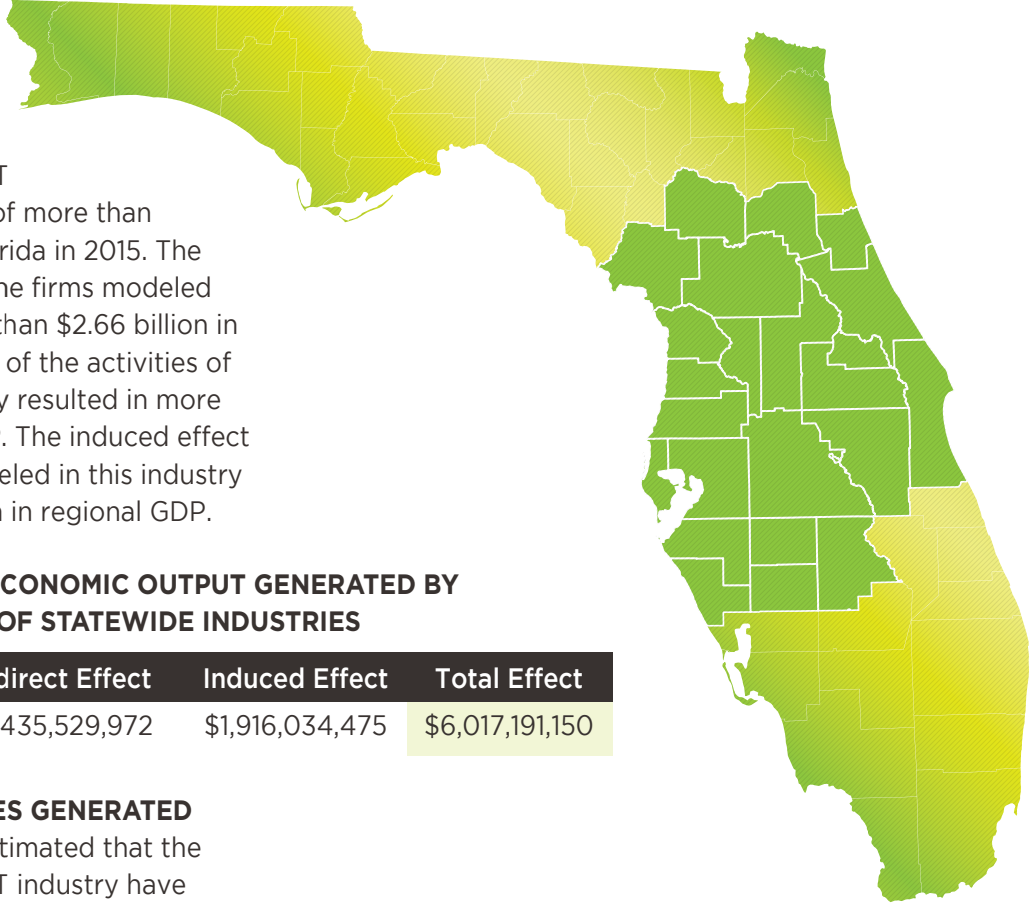


TABLE 3.4: TOTAL ECONOMIC OUTPUT GENERATED BY ACTIVITIES OF STATEWIDE INDUSTRIES

Industry	Direct Effect	Indirect Effect	Induced Effect	Total Effect
MS&T	\$2,665,626,703	\$1,435,529,972	\$1,916,034,475	\$6,017,191,150

3.2.4 STATE AND LOCAL TAXES GENERATED

As indicated by Table 3.5, it is estimated that the activities of the firms in the MS&T industry have generated total state and local taxes of more than \$354 million¹⁵ while also generating more than \$1.03 billion in federal taxes.

TABLE 3.5: TOTAL STATE AND LOCAL TAX GENERATED BY ACTIVITIES OF STATEWIDE INDUSTRIES

Taxes	Tax Source					Total
	Employee Compensation	Proprietor Income	Production & Imports	Households	Corporations	
State & Local	\$5,849,206	\$0	\$309,166,430	\$29,315,870	\$10,422,844	\$354,754,350
Federal	\$512,156,310	\$17,194,221	\$40,640,974	\$391,923,960	\$77,626,743	\$1,039,542,208

4.1 ILLUSTRATIVE MS&T SUCCESS IN FLORIDA

Florida is home to the world's largest MS&T cluster, encompassing hundreds of companies that provide virtual, augmented and mixed reality training for defense and commercial purposes.

Companies from across the United States invest in Florida MS&T research, attend Florida MS&T activities, and leverage Central Florida as a "hub" for developing business networks and developing critical technology partnerships.

A case and point¹⁶ of this are Lockheed Martin, Cole Engineering and Boeing who are key innovators in Florida's MS&T industry. These companies use state-of-the-art technologies that save money, resources and lives.

Lockheed Martin's MS&T business provides surface, air and undersea applications on more than 460 programs for the United States military and international customers. The company recently opened its Innovation Demonstration Center. The 20,000-square-foot building offers a full spectrum of ground and military training simulations, as well as a separate wing focused on F-35 flight training.

"The simulation and training technology we create has helped our customers reach new heights in capability, reliability and efficiency across the board. That is a heritage we are proud to be a part of and one that is thriving right here in the Central Florida community," said Jon Rambeau, vice president and general manager, Lockheed Martin Training and Logistics Solutions. "The launch of our new Innovation Demonstration Center marks the next chapter in that legacy, providing a world-class

collaboration venue for our customers, community and industry partners."

For more than a decade, Cole Engineering Services Inc. (CESI) has been at the forefront of developing simulation-based training, technical services and other support services for the U.S. military and first responders. CESI was founded in Florida and, due to its past success, chose to expand its in-state headquarters and research and development operations.

"Cole Engineering is proud of the work we do to help train the brave men and women who have chosen to defend our freedom, and Florida has proven to be an ideal location for our company to meet their needs," said Cole Engineering CEO Bryan Cole.

South Florida is a center for simulated flight training. When Boeing moved its training simulators from Seattle to Miami, it joined Airbus and Pan Am International Flight Academy. Together these companies make up one of the largest concentrations of flight simulators and commercial aviation training of any city in the world. The Boeing move was attributed in part to Miami's distinction as the hub of the Americas.

"Boeing is adding nearly \$100 million in training assets to the Miami campus, representing a significant positive impact for the local Miami-Dade economy," said Sherry Carbary, vice president, Boeing Flight Services. "The result will be a premier state-of-the-art training campus staffed by world-class qualified and experienced pilots and instructors all providing the highest quality training in a well-established, flexible and productive work environment."

4.2 CRITICAL CONTRIBUTION

Florida MS&T makes a critical contribution to military readiness and effectiveness across the United States.

This contribution represents a critical and unique national asset and capability that developed over the course of 70 years, and cannot be easily replaced or relocated. MS&T technologies are lower-cost solutions to expensive legacy, hardware-intensive platforms, and are increasingly driven by private-sector innovation and competition versus proprietary military technologies. New soldiers expect to be trained in MS&T environments, and to have access to ubiquitous, on-demand information

and training. Private-sector medical simulation technology is just beginning to gain momentum, and has potential to eclipse military MS&T in demand and growth. As other U.S. regions suffer from BRAC closures and non-MS&T procurement budgets decline, Florida MS&T will face increasing pressure from competitors to evolve and not lose its key resources.



FLORIDA MS&T MAKES A CRITICAL CONTRIBUTION TO MILITARY READINESS AND EFFECTIVENESS ACROSS THE UNITED STATES.

While this report and the analysis it summarizes focuses on Florida statewide impacts, the contributions of Florida's MS&T industry cluster to defense, medical and entertainment industries throughout the United States and the world should not be overlooked or minimized.

WHAT IS IMPLAN?¹⁷

IMPLAN[®] is an acronym for Impact analysis for PLANning. The IMPLAN[®] System is a general input-output model that is comprised of software and regional data sets. One of the most powerful aspects of IMPLAN[®] is that input-output models for specific regional economies can be created. Rather than extrapolating regional data from national averages, IMPLAN[®] measures economic impacts from data representing actual local economies. IMPLAN[®] data sets are available from the ZIP code level to the national level, and regional files can be combined to create precise geographic definitions when calculating impacts. The analysis results provide the IMPLAN[®] user or client with a report that demonstrates the detailed effects of local changes on supporting industries and households. Reports can provide both detailed and summary information related to job creation, income, production and taxes. IMPLAN[®] Version 3.0 can even track the impacts of a local change on surrounding regional economies.

IMPLAN[®] data tracks all the available industry groups in every level of the regional data. This permits detailed impact breakdowns and helps ensure accuracy of inter-industry relationships. If a study involves the introduction of an industry group that does not already exist in the local area, IMPLAN[®] provides tools to create a new industry. This new industry can be used as a proxy to estimate the likely impacts of the new

industry's production to the local economy. And if the industry exists in IMPLAN[®], but doesn't exactly match the sales and employment information for the industry being modeled, the IMPLAN[®] industry relationships may be updated to match the known values, while still maintaining the local regional sales and employment averages for examining the indirect and induced impacts.

Figure 5.1 illustrates the framework of the IMPLAN model. Economic impact studies typically generate large amounts of information about local industries, employment, wages, profits, labor spending and taxes that may be useful for a variety of purposes and circumstances. Most reports, therefore, seek to condense this information into a format that demonstrates the overall effect of the economic

FIGURE 4.1: IMPLAN MODEL FRAMEWORK

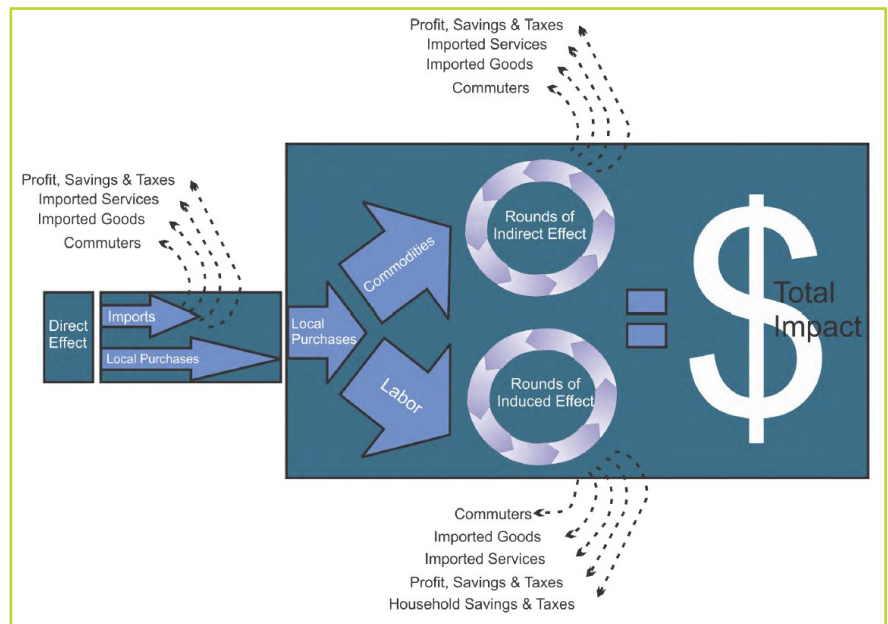


TABLE 5.1: DEFINITION OF IMPLAN TERMS

IMPLAN Term	Definition
Backward Linkages	The tracking of industry purchases backward through the supply chain.
Direct Impact	The initial expenditures, or production, made by the industry experiencing the economic change.
Indirect Impact	The effects of local inter-industry spending through the backward linkages.
Induced Impact	The results of local spending of employee's wages and salaries for both employees of the directly impacted industry, and the employees of the indirectly affected industries.

change as it relates to jobs or other monetary means, and in a manner that is meaningful to the report's intended audience. To generate the detailed background information that supports the overall effects economic factors have on the local region, or even on surrounding regions, economic impact analysis looks backward rather than forward through the economy. In other words, to determine the effect of increased production in a local industry, economic analysis looks at the industries which supply the producing industry with the items and services that industry incorporates into its production.

So an increase in window production will result in the manufacturer purchasing a variety of supplies including wood, glass and furnishings for the windows, all of which will be incorporated into the final product. Collectively, tracing the impacts back through the supply chain is tracing the backward linkages. Each supplier in the chain represents a backward linkage. Since each supplier of an industry has to purchase inputs from other suppliers in order to create their own products (e.g. the window furniture company has to purchase sheet metal from which it stamps out its parts), the accumulation of these backward linkages can be tracked until the resultant spending of the original impact is completely removed from the economy by imports, savings, taxes and profits.

These consecutive rounds of inter-industry spending traveling back through the supply chain are called the indirect effects. These impacts are "indirect" because the increase in this industry's production is stimulated by the increase of sales in another

industry. Increases in production not only require an increase in purchases of supplies, but typically also require an increase in employment and/or labor spending. This increase in labor dollars also has traceable economic effects, because increased labor dollars typically translate into increased income spending. The spending of income earned by the employees, resulting from both directly and indirectly affected industries, contributes to the induced effect. The induced effect, therefore, is a measurement of employee spending of all employees of the directly affected industry, and all the employees of subsequent indirectly impacted industries in the supply chain, as long as these employees live within the defined geography of the study.

IMPLAN® also reports on the state/local taxes collected as a result of the modeled scenario. In the employee compensation field, IMPLAN® reports on the amount of the employer collected and paid social security taxes on wages. For state/local taxes, these values are mostly contributions to government retirement funds. Taxes on production and imports are collected by the businesses on behalf of the state and local governments. These taxes include sales tax, property tax, motor vehicle tax, severance tax, business licenses taxes, and documentary and stamp taxes. Taxes reported under households include personal income tax (none for Florida), personal vehicle fee payments, personal property taxes, fines, donations and licensing fees. Taxes on corporations include corporate tax payments on profits and dividends paid to governments on government investments.

WHAT IS TEAM ORLANDO?¹⁸

Team Orlando's mission is to "Provide a collaborative interservice military body in the Orlando, Florida, area in support of Department of Defense (DoD) requirements for Modeling & Simulation (M&S), Advanced Distributed Learning, training systems and human performance; provide senior-level guidance and interaction to facilitate cross-pollination of technologies and lessons learned as they relate to training and instrumentation issues in support of service requirements and initiatives; provide senior level guidance to support the DoD vision for outreach to the Central Florida community."

Their organizational structure is organized into two boards: the Executive Board of Directors (E-BOD) for strategic vision and guidance, and the Board of Directors (BOD) for execution. The executive board of directors consists of the commanders of the principle commands from the four services and two advisors. The E-BOD meets annually, or as required, to guide and approve plans, decisions and actions of the board of directors. The advisors provide advice on joint training and M&S issues as appropriate.

EXECUTIVE BOARD MEMBERS:

- Program Executive Officer, Simulation, Training and Instrumentation (PEO STRI)
- Commanding Officer, Naval Air Warfare Center Training Systems Division (NAWCTSD)
- Program Manager, Training Systems, Marine Corps Systems Command (MARCORSYSCOM)
- Commander, Air Force Agency for Modeling and Simulation (AFAMS)

ADVISORS:

- Director, Training Readiness and Strategy, Office of the Secretary of Defense
- Vice Deputy Director, Joint Staff J7 for Joint and Coalition Warfighting

The board of directors consists of senior leaders from the service commands, as well as other Team Orlando federal agencies. Liaison representatives provide a non-federal perspective when solicited by the board. They are invited guests of the BOD that

serve at the convenience of the BOD and do not vote on issues. The BOD meets monthly and decides on courses of action and implemented plans to execute E-BOD guidance using their respective in-house resources, provide execution guidance and direction to the Joint Training Integration and Evaluation Center, and ensure relevant issues are brought to the E-BOD for guidance and decisions.

TEAM ORLANDO BOD:

- Director of Operations and Acquisition, NAWCTSD
- Assistant Program Executive Officer for Customer Support, PEO STRI
- Technical Director, AFAMS
- Deputy Program Manager for Training Systems, MARCORSYSCOM
- Director, Advanced Distributed Learning Initiative
- Director, ARL RDECOM Simulation and Training Technology Center
- Director, Army Research Institute - Orlando Research Unit
- Liaison Officer, Federal Law Enforcement Training Center
- Program Manager, Veterans Health Administration Simulation Learning Education And Research Network
- Deputy Director, Air Force Training System Product Group

TEAM ORLANDO BOD LIAISONS:

- Representing Industry: President, National Center for Simulation
- Representing Academia: Director of the Institute for Simulation and Training, University of Central Florida
- Representing non-Federal government: Director, Metro Orlando Economic Development Commission

The BOD is responsible for: developing a strategy for further teaming between the services related to training products and services; providing senior leadership visibility for issues of mutual concern that promote human performance, M&S and training for the military services, DoD and other federal agencies; promoting Team Orlando and the

individual commands as a resource and mechanism for increased collaboration among the services and as a resource for HP and training systems collaboration; leveraging the collective capabilities of the participating organizations to promote human performance, training, M&S and joint initiatives; promoting Team Orlando activities to other senior service leaders; providing acquisition expertise to military services, DoD and other federal agencies; developing a strategy to execute the DoD's STEM & Outreach Strategic Plan; and, developing and publishing a Team Orlando Concept of Operations detailing how Team Orlando operates as a collaborative interservice body.

Member responsibilities for each organization include: providing a senior representative to serve on the Team Orlando BOD; identifying requirements that enhance and support the missions of each member organization and the overall mission of Team Orlando; creating opportunities for collaboration and assisting in identifying all possible funding sources; and, promoting the sharing of human performance, training and M&S information in support of technology improvements and communicating ongoing initiatives within their parent service. The Team Orlando charter is reviewed and updated, as appropriate, every two years, and is signed by the four E-BOD members.

WHAT IS NATIONAL CENTER FOR SIMULATION (NCS)?¹⁹

The NCS is a nonprofit national organization with government, academic and industry members operating as an open consortium. The National Center for Simulation was formed in 1993 as the link among the defense industry, government and academia on behalf of the entire modeling, simulation and training community. Its mission is to facilitate networking among its growing local, national and international membership, and potential partners and customers in government, industry, education and commerce.

As a forum, showcase, advocate and archive for simulation, training and modeling knowledge and resources, NCS works to strengthen the simulation community's synergy, foster innovation, and tell the story of modeling, simulation and training to decision-makers and the general public. NCS members actively create an environment where collective efforts result in new awareness and applications for military readiness, space exploration,

health care, transportation, education, entertainment and technology development.

The mission of NCS is to serve as the nation's focal point and as a catalyst for the development, understanding, and advancement of simulation and related technologies; to improve defense readiness and facilitate space exploration; to support education and training initiatives; and, to extend useful applications of simulation. NCS promotes coordination, collaboration and public awareness for its national and international member organizations.

NCS is headquartered in Orlando, Florida – home of the epicenter of the modeling, simulation and training industry and more than 150+ industry companies, the University of Central Florida, the acquisition commands for the Army, Navy and Marine Corps, the Air Force Agency for Modeling & Simulation, plus 10 other federal government agencies and joint commands. Orlando's Research Park provides an environment that fosters collaboration, cooperation and partnership between academia, industry and government found nowhere else in the world.

- ¹ All dollar amounts are listed as 2016 dollars
- ² In economic impact parlance total impact = direct impact + indirect impact + induced impact
- ³ Impacts of Florida Modeling, Simulation and Training - A Research Report Sponsored by the Florida High Tech Corridor Council for the National Center for Simulation | September 2012
- ⁴ *ibid*
- ⁵ *ibid*
- ⁶ Please refer to Appendix: National Center for Simulation for a detailed description of NCS
- ⁷ Please refer to Appendix: Team Orlando for a detailed description of Team Orlando
- ⁸ *ibid*
- ⁹ *ibid*
- ¹⁰ Please see the Appendix: IMPLAN Information (on page 10) for a detailed description of the different types of economic impacts
- ¹¹ Please see the Appendix: IMPLAN Information for a brief description of IMPLAN
- ¹² Impacts of Florida Modeling, Simulation and Training - A Research Report Sponsored by the Florida High Tech Corridor Council for the National Center for Simulation | September 2012
- ¹³ Reported in 2016 dollars
- ¹⁴ *ibid*
- ¹⁵ *ibid*
- ¹⁶ Excerpt taken from <https://www.enterpriseflorida.com/news/floridas-modeling-simulation-and-training-sector-a-world-leader/>
- ¹⁷ The following section contains excerpts from various sections of “Day, F. (2012). Principles of Impact Analysis and IMPLAN Applications. Davidson, NC, USA: MIG”
- ¹⁸ The following section contains excerpts from <http://www.teamorlando.org/what-is-team-orlando/>
- ¹⁹ The following section contains excerpts from <https://www.simulationinformation.com/about/background>