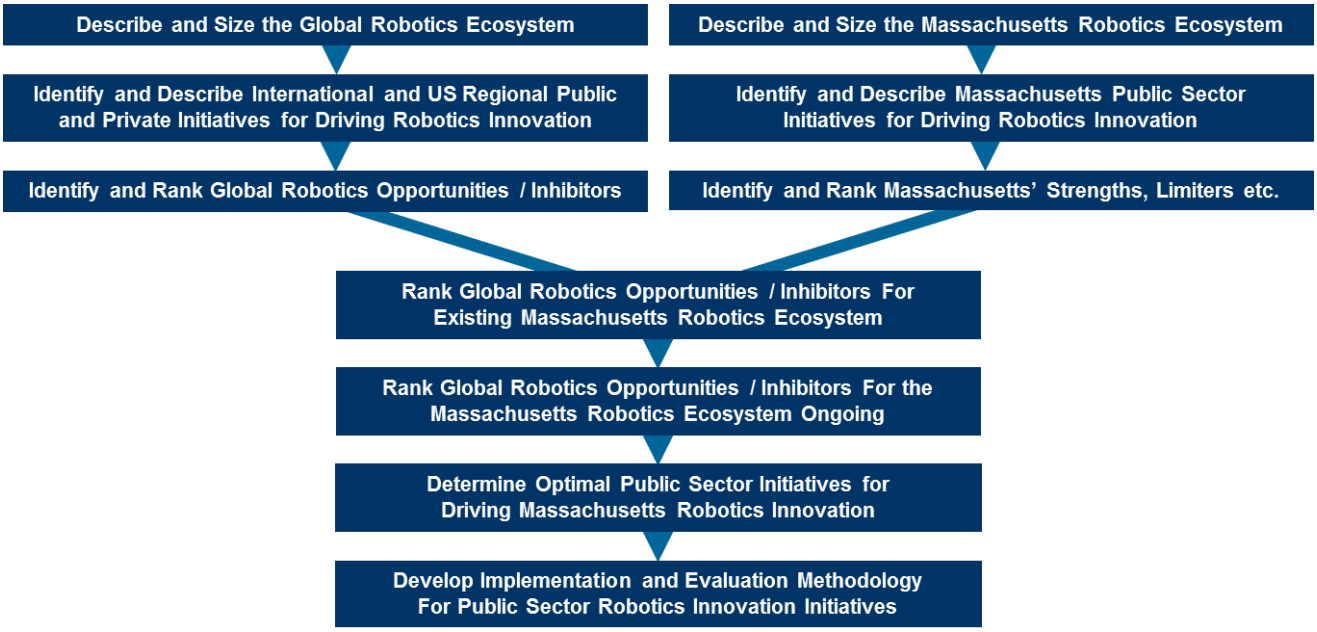
Introduction

The Massachusetts Technology Collaborative, a public economic development agency, has selected ABI Research to conduct an analysis of the robotics sector writ large, including describing and quantifying the global robotics marketplace, highlighting dominant research, technical, business and investment tends, as well as analyzing public and private robotics business development initiatives worldwide. Particular emphasis will be placed on uncovering market opportunities that are aligned with the inherent strengths of the Massachusetts innovation economy.

As part of this process, ABI Research, in consultation with MassTech's Innovation Institute, will build an advisory board consisting of Massachusetts-based business, academic, and investment leaders, as well as conduct interviews with key contributors to the greater Massachusetts robotics ecosystem. The expectation is that the results of this study will be used to inform decision making regarding public and private robotics business development initiatives, so that working collaboratively the competitive position of Massachusetts in this vital economic sector can be optimized and strengthened. The work will generally follow the outline given below:

Figure 1: Generalized Processes for the Massachusetts Robotics Ecosystem Innovation Study



Statement of Work

1. **Develop and support a Massachusetts Robotics Study Advisory Board in consultation with the Massachusetts Technology Collaborative which includes:**
   - **1.1.** Build a List of Potential Advisory Board members
   - **1.2.** Review and update list in consultation with MassTech
   - **1.3.** Recruit, coordinate and support the Advisory Board for the duration of the engagement

2. **Massachusetts Robotics Ecosystem Interviews (See Table 1, below)**
   - **2.1.** Develop List of Potential Massachusetts Robotics Ecosystem Interviewees
   - **2.2.** Develop Questions for Massachusetts Robotics Ecosystem Interviews
   - **2.3.** Develop Summarizations

Table 1: Proposed Robotics Ecosystem Interview Coverage

Robotics Ecosystem Stakeholders	Robotics Sector		
	Industrial Robotics	Service Robotics	Consumer Robotics
Companies Producing Robotics Technologies	2	2	2
Companies Utilizing Robotics Technologies	2	2	N/A
Companies Producing Enabling Technologies For Robotics	3		
Academics/Researchers	3		
Investment Professionals	2		
STEM Education Professionals	2		
Directors of Massachusetts Innovation Economy Initiatives	1		

3. **Provide a Framework for Understanding and Evaluation**
   - **3.1.** Develop Taxonomic Framework
     - **3.1.1.** Industrial Robotics
       - **3.1.1.1.** Definition
       - **3.1.1.2.** Representative Use Cases/Applications
       - **3.1.1.3.** Representative Markets
       - **3.1.1.4.** Representative Companies/Products
       - **3.1.1.5.** Market Size - Geographic breakouts for North America, Western Europe, Asia and ROW
       - **3.1.1.6.** Recent Trends
         - **3.1.1.6.1.** Collaborative Robotics
     - **3.1.2.** Professional Service Robotics
       - **3.1.2.1.** Definition
       - **3.1.2.2.** Representative Use Cases/Applications

3.1.6.6. Internet of Things (IoT) and Industrial Internet Architectures and Services
3.1.6.7. Robot Operating Systems (ROS) and Open Source Solutions

4. Analyze, Describe and Size the Current Global Robotics and Intelligent Systems Sector
For this study, ABI Research will prepare a briefing document which describes those macro trends, the repeating patterns of significance derived from the broad technological, business and research forces, that are driving the current (and future) robotics industry across four geographic regions:

4.1. North America
- **4.1.1.** Robotics Sales, Installations, Adoption Patterns
- **4.1.2.** Public Sector Innovation Investment and Development Trends
- **4.1.3.** Robotics Innovation Cluster Development Efforts
- **4.1.4.** Private Sector Innovation Investment and Development Trends
- **4.1.5.** Robotics Ecosystem Attributes
- **4.1.6.** Industry Investment, Development and Acquisition Trends
- **4.1.7.** Political, Social and Business Drivers
- **4.1.8.** Quantifying Opportunity
  - **4.1.8.1.** Critical Markets
  - **4.1.8.2.** Critical Application Areas
  - **4.1.8.3.** Critical Capabilities
  - **4.1.8.4.** Critical Research and Technology

4.2. Western Europe
- **4.2.1.** Robotics Sales, Installations, Adoption Patterns
- **4.2.2.** Public Sector Innovation Investment and Development Trends
- **4.2.3.** Robotics Innovation Cluster Development Efforts
- **4.2.4.** Private Sector Innovation Investment and Development Trends
- **4.2.5.** Robotics Ecosystem Attributes
- **4.2.6.** Industry Investment, Development and Acquisition Trends
- **4.2.7.** Political, Social and Business Drivers
- **4.2.8.** Quantifying Opportunity
  - **4.2.8.1.** Critical Markets
  - **4.2.8.2.** Critical Application Areas
  - **4.2.8.3.** Critical Capabilities
  - **4.2.8.4.** Critical Research and Technology

4.3. Asia
- **4.3.1.** Robotics Sales, Installations, Adoption Patterns
- **4.3.2.** Public Sector Innovation Investment and Development Trends
- **4.3.3.** Robotics Innovation Cluster Development Efforts
- **4.3.4.** Private Sector Innovation Investment and Development Trends
- **4.3.5.** Robotics Ecosystem Attributes
- **4.3.6.** Industry Investment, Development and Acquisition Trends
- **4.3.7.** Political, Social and Business Drivers

4.3.8. Quantifying Opportunity
4.3.8.1. Critical Markets
4.3.8.2. Critical Application Areas
4.3.8.3. Critical Capabilities
4.3.8.4. Critical Research and Technology

4.4. Rest of World
4.4.1. Robotics Sales, Installations, Adoption Patterns
4.4.2. Public Sector Innovation Investment and Development Trends
4.4.3. Robotics Innovation Cluster Development Efforts
4.4.4. Private Sector Innovation Investment and Development Trends
4.4.5. Robotics Ecosystem Attributes
4.4.6. Industry Investment, Development and Acquisition Trends
4.4.7. Political, Social and Business Drivers
4.4.8. Quantifying Opportunity
4.4.8.1. Critical Markets
4.4.8.2. Critical Application Areas
4.4.8.3. Critical Capabilities
4.4.8.4. Critical Research and Technology

5. Analyze, Describe and Size the Existing Massachusetts Robotics Ecosystem

ABI Research will generate a Massachusetts robotics ecosystem status report covering, but not limited to, the following subjects. Efforts will be made to quantify, of at the very least, rank, all entries:

5.1. Existing Companies
5.1.1. Number and Types of Companies
5.1.2. Revenue Figures
5.1.3. Growth Estimates
5.1.4. Employees
5.1.5. Key Markets
5.1.6. Key Application Areas

5.2. Business Development
5.2.1. Business Formation
5.2.2. Awarded Commercial Contracts
5.2.3. IPO and M&A Activity
5.2.4. Office Locations of Non-Massachusetts Based Firms (ex. Aldebaran Robotics)

5.3. Investment
5.3.1. Venture Capital Investments for Robotics Start-Ups
5.3.2. Federal Funding for Commercial R&D Initiatives
5.3.3. Industry Funding for Commercial R&D Initiatives

5.4. Research Initiatives
5.4.1. Federal Funding for Academic Research and R&D Initiatives
5.4.2. Industry Funding for Academic Research and R&D Initiatives

- **5.4.3.** Academic Article Output
- **5.4.4.** Book Production
- **5.4.5.** Journal Citations

5.5. Technology Development

- **5.5.1.** Technology Patents and Awards
- **5.5.2.** Technology Licensing
- **5.5.3.** SBIR/STTR Awards

5.6. Workforce Development

- **5.6.1.** Industry Plans for Hiring
- **5.6.2.** Current and Future Workforce Needs
- **5.6.3.** Training and Retention Strategies
- **5.6.4.** Workforce Education Levels

5.7. Education

- **5.7.1.** Public Sector Investment in K-16
- **5.7.2.** STEM Career Choices and Degrees
- **5.7.3.** Private Technology Camps / Competitions

5.8. Other Facilitators

- **5.8.1.** Start-Up Accelerators
- **5.8.2.** Professional Associations
- **5.8.3.** Meetings, Conferences and Expositions
- **5.8.4.** Media Coverage / Citations

6. **Identify and Prioritize Market Opportunities for the Massachusetts Robotics Sector**
   Based on the opportunities of high strategic value and predisposition for strong growth surfaced in Section 3 - Current State Global of the Robotics and Intelligent Systems Sector – and in keeping with key strengths of the Massachusetts robotics ecosystem, ABI Research will make recommendation as to the optimal industries, markets, capabilities and technologies, markets, that should be pursued to drive robotics innovation and ongoing economic growth.

7. **Identify and Describe Public Sector Initiatives for Promoting Robotics Business Development**
   ABI Research will identify and describe current and announced North American public sector initiatives such as the Pittsburgh/Carnegie Mellon University robotics cluster, San Diego's Robotics Innovation Hub and more. Sources of funding and their amounts will be included, along with listening of cluster participants, key target markets, overall approach, expected results and more.

8. **Guidance, Recommendations and Action Items**
   ABI Research will provide a set of recommendations and action items for public sector initiatives for designed to drive Massachusetts robotics innovation.

9. Implementation and Evaluation Methodology

ABI Research will develop a formal implementation guide for executing of the recommendation and action items given in Section F. Moreover, measurable innovation performance used to gauge and grade ongoing innovation performance will be provided.

10. Deliverables

- **10.1. Report Editing**
- **10.2. Report Review**
- **10.3. Report Printing and Binding**
- **10.4. Power Point Development**

Contact

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