1. Introduction to Harbor Research
2. Proposed Scope of Work, Process, & Budget
3. Appendix
Overview of Harbor Research & Our Scope of Services

**Firm History**
Harbor Research was the first firm to focus on Smart Systems, Services and the Internet of Things (IoT) and first to publish groundbreaking research on new business models in the Harvard Business Review in 2004 & 2005.

**Clients and Engagements**
For over 30 years we have focused on identifying, analyzing and helping clients to develop or adopt emergent technologies. Every relationship we develop is enhanced by the range and depth of these experiences.

**Technology Developers & Suppliers**
- 100+ clients
- 400+ engagements

**OEMs and Service Providers**
- 150+ clients
- 600+ engagements

**Offices**
- Denver, Colorado - USA
- Berlin, Germany - Europe

---

**Overview of Harbor’s Services**

**Research Services**
Research, tracking, market intelligence and Harbor’s Smart Systems forecast

**Strategy Consulting**
Business development & growth strategy consulting services

**Smart Systems Lab**
Venture development, start-up advisory and community networking to implement strategies

---

We work with clients across corporate functions

- Corporate Strategy & Development
- Business Development
- Market Intelligence
- Strategic Marketing
- New Growth
- Research & Development

Flexible formats & configurations

We work with clients across corporate functions

- Research, Analysis, Modeling & Content
- Services Subscriptions & Retainers
- Bespoke Engagements & Consulting Projects
Harbor’s long-standing support for the Association for Smarter Homes & Buildings

- Harbor has developed a sustaining relationship with ASHB and its constituent members conducting research and analysis into new building, facility and residential technologies.
- ASHB Landmark Research Projects include a combination of quantitative surveys and qualitative interviews that inform a comprehensive report on the market opportunity for smart systems-related technologies and related digital services, including:
  - **Healthy Buildings & Indoor Environmental Quality** (2023)
    - Analyzed equipment, software, and service opportunities to improve indoor environmental quality in commercial buildings, as well as how to make buildings more health for occupants.
  - **AI and Predictive Maintenance in Intelligent Buildings** (2022)
    - Defined and developed business opportunities within predictive maintenance and artificial intelligence technologies as they relate to intelligent buildings.
  - **Intelligent Building Energy Management Systems** (2021)
    - Provided a framework, market requirements, ecosystem analysis and market sizing for the building automation systems, energy storage, and other energy management hardware, software, and service solutions including services, security, data analytics, systems.

Harbor is Pleased to Have Served ASHB Several Times in Recent Years

<table>
<thead>
<tr>
<th>Harbor/ASHB IBC Collaboration Examples</th>
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<td>2023</td>
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2023 IBC Research Service

- **Building Operator Survey**
  - Characterized survey respondents

- **Quarterly Market Tracking**
  - Acquisitions, Investments, and Divestitures Announcements Summary
  - Ecosystem and Market Environment Summary Q2 2023

- **Configured Research Projects**
  - AI in Intelligent Buildings
  - Impact of Sustainability in Intelligent Buildings
  - Ecosystems & Interoperability in Intelligent Buildings
Project Team Overview

Each member of the team has led or assisted on multiple intelligent buildings-related engagements, including at least one previous ASHB Landmark Research project.

Glen Allmendinger - President and Founder (40 years experience)
Glen is the founder and president of Harbor Research, a strategy consulting firm with offices in Boulder, Colorado and Berlin, Germany. Since the firm’s inception in 1983, Allmendinger has worked closely with a broad spectrum of telecommunications, information systems, security, electronics, and automation and equipment manufacturing companies in North America, Europe, and the Far East. These companies range in scope from small, entrepreneurial start-ups to major multi-national corporations. His project direction and consulting has assisted these firms in the development of corporate and business unit strategies, new product, market and service opportunities, and new core capabilities. Glen has consulted to the National Research Council on technology and competitiveness as well as emerging technologies for social wellbeing. He is a member of IEEE, ASME, and ACM and has worked closely with several industry trade associations including ASHB. He has worked on DARPA-funded research focused on advanced analytics and sensing systems technology and was a key participant in the planning and development of the National Center for Manufacturing Sciences. Allmendinger received his BA from New York University, and completed graduate studies at MIT’s Center for Advanced Media Studies.

Daniel Intolubbe-Chmil – Research Director (8 years experience)
As Harbor’s Research Director, Daniel has led research initiatives shaping critical insight around the evolution of high-performance networks across industrial, commercial and enterprise verticals. Daniel also helps keep a pulse on the market, providing curated content and updates to Harbor’s real-time market tracking across all sectors of the economy. Dan has helped lead two previous ASHB Council engagements, and has deep expertise across networking technologies within buildings and homes. Prior to Harbor, Daniel has conducted economic research to complete his Honors thesis regarding Education Policy, entailing policy/market research and econometric analysis. He graduated from CU Boulder with a degree in Economics with Honors and a minor in Humanities.

Harry Pascarella – Vice President (10 years experience)
Harry specializes in Industrial and Commercial IoT with a focus on manufacturing, natural resources, and mission critical B2B markets. Harry works with clients across a variety of industries to validate and dimension their growth strategies and advise on industry segment and application target selections. Recently, Harry conducted several studies in smart buildings including a deep dive into energy management as well as a market study on the larger market that looked at usage behavior. Harry also worked with the largest LED lighting manufacturer in the United States to develop a business case for connected lighting platforms. Harry received his bachelor’s degree in Economics with Honors from the University of Colorado – Boulder.

Pablo Cruz – Senior Associate (3 years experience)
As a senior associate at Harbor Research, Pablo drives client success across various industries. His experience spans industrial manufacturing and process software, R&D processes, life sciences technologies, AI/ML operations, among other emerging technology areas. His experience includes guiding clients through the selection and delivery of emerging technologies, leveraging quantitative and qualitative inputs to create holistic value creation strategies. Prior to joining Harbor, Pablo worked in Deloitte’s global trade division, where he helped streamline client responses to complex global trade regulations, optimize their trade practices and develop effective strategies for regulatory compliance. Pablo graduated from The University of Chicago with a BA in public policy with a specialization in statistics, stemming from a keen interest in the intersection of policy analysis, strategic decision-making, and data-driven solutions.
1. Introduction to Harbor Research

2. Proposed Scope of Work, Process, & Budget

3. Appendix
2024 Intelligent Buildings Research Service: Overview of Proposed Approach

Instead of one, long-form landmark research report each year, ASHB would like to pursue a more configured set of research activities that focuses on multiple topics of interest to funders throughout the year. With significant experience in providing such services and supporting ASHB over the years, Harbor can support ASHB and the Board of Directors well in this endeavor.

Intelligent Buildings Research Service: Overview of Components

1. Annual Building Operator Trends Survey
   - Survey covering key topics/opportunities to gain annual perspective of operator needs/outlook
   - 20-30-page survey highlights report
   - Raw data in Excel
   - 2-3-page executive summary in Word
   - Summary infographic

2. Intelligent Buildings Market Sizing & Forecast
   - Worldwide, configured market sizing and forecast model for intelligent buildings devices, systems, technologies with breakouts for US/CAN and other major regions
   - Excel-based market sizing and forecast model with summary portrayals in PowerPoint

3. Quarterly Market & Technology Tracking (x3)
   - Intelligent buildings-related M&A, key funding rounds, and similar maneuvers from prior quarter
   - Other key tech/market news, such as policy and regulatory updates from prior quarter

4. Configured Research Project (x2)
   - Based on Q1 discussions and activities, determine 2 configured research projects to complete following survey
   - Incorporate topics into the survey to ensure data availability
   - 100 hours of analyst time per project
   - 15-25-page PowerPoint research brief
   - One summary infographic per research project (x2 total)

5. Steering Committee Meetings and Other Interactions
   - 6-7x Steering Committee Meetings
   - 1:1 introduction calls with each Steering Committee org
   - Final webinar (2 hours)
   - Organization webinars for each SC organization covering summary of all research following final webinar
   - Think Tank for ASHB community
Proposed Research Timeline: March Through October 2024

Harbor will support ASHB and the funders over the course of 8 months in 2024, from March through October. The work steps will be executed in parallel, with regular steering committee meetings to update on progress and interim outputs.
Annual Building Owner/Operator Intelligent Buildings Survey

Harbor will develop and conduct an annual survey for intelligent buildings with the goal of staying up to date on owner/operator perceptions, adoption trends, and needs related to intelligent buildings.

**Target Audience**

~300 Commercial Buildings Owner/Operators in Canada and USA

**Proposed Scope**

Annual survey to understand current perceptions and future priorities related to intelligent buildings

Key Topics to Cover (starting point):
- Current state of intelligent building adoption
- Key trends impacting investment and priorities
- Next 12 months investment priorities
- Preferred suppliers
- Other topics as appropriate, as informed by initial discussions and configured research selections

*Draft starting point for Annual Survey scope, to be refined via steering committee meetings*

**Deliverables**

- Survey questionnaire
- Raw data and summary charts in Excel and PPT
- 20-30-page survey PPT ebook and trends report
- 2-page long-form executive summary (Word doc)
- 1 summary infographic

**Benefits & Values**

- Stay up-to-date on customer perceptions, adoption, and needs related to intelligent buildings
- Understand the impact of recent market developments on users
- Leverage graphics and charts from PPT-based trends report in key external presentations
- Focus on topic areas for further research in configured research projects
Intelligent Buildings Market Sizing & Forecast Overview

Harbor Research has an extensive market sizing and forecast model that analyzes the market opportunity for Smart Systems and IoT. Harbor will develop a configured and in-depth market sizing model and 10-year forecast for Intelligent Buildings.

Smart Systems Revenues Overview

Our forecast model looks at four main revenue streams reflecting Harbor’s tech stack: Enablement, Network Services, Systems Applications and Value-Added Applications.

- Enablement revenue is determined by the cost of the embedded or aftermarket chip that enables connectivity in a device
- Network services revenue is the annual service costs associated with connecting a device to the internet
- System applications revenue consists of functions that really enable these devices to share data to help inform the value-added applications. This revenue stream goes all the way down to the value that these devices deliver in the marketplace
- Value added applications are the higher order view that brings value back into the Enterprise by utilizing a set of system applications to drive device and application integration

As clients are looking to increase business profits around opportunities within smart systems, once you enable the system, it is using the data derived from these systems that drives new insights, increases efficiencies, and reduces downtime.
Intelligent Buildings Market Sizing & Forecast Methodology Overview

Harbor will work with the steering committee to ensure alignment on the scope and methodology of the 10-year forecast for devices, equipment, software and services in intelligent buildings.

Key Input Variables
- Number of buildings by segment
- Additional market sizing inputs:
  - Floorspace (sq ft)
  - Employee density
  - Climate region
  - Operating hours (weekly avg.)
  - Ownership type (non-government, government)
- Devices/equipment per building
- The Commercial Building segmentation will be analyzed in the context of building use or enterprise function, which in part will be characterized by the building type

Forecast Alignment
- Integrating building and device demographics to triangulate the market opportunity for connected, intelligent devices for commercial building environments in North America
- Building and device demographics will be integrated into the following HRI frameworks:
  - SSSF Venue Map: Commercial Buildings
  - SSSF Technology Stack
  - SSSF Use Case and Application Framework

Resulting Key Output
- Devices Shipped & Installed by Segment: Harbor will segment the device opportunity in terms of the volume of shipped and installed units and value of integrated Smart Systems
- Revenue Stack: Smart Systems Forecast revenue includes Enablement, Network Services, System Applications and Value Added Applications
- Use Case Revenue: Commercial Building SSSF revenue opportunity will be further segmented across the HRI Use Case framework
- Regional Analysis: regional breakouts for Canada and the US will be applied to device volume and value
Quarterly Market & Technology Tracking Overview

Harbor will develop a quarterly tracking report for Intelligent Buildings focused on news and events of interest from the prior quarter. Each report includes an overview of key events, analysis from Harbor analysts and key opportunity takeaways.

Draft starting point for tracking categories and dimensions, to be refined via steering committee meetings

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Event Types
- Mergers and acquisitions
- Investment and funding rounds
- Standards, regulations and key policies impacting buildings
- Key product/solution announcements
- Key partnerships/relationships

Supplier Types
- Computing & Connectivity
- Automation & Control
- OEMs/Machine Builders
- Electric/Gas/Water Utilities
- Telecom/Cloud Service Providers
- Independent Software Vendors
- System Integrators
- Property Management

Intelligent Buildings Opportunities

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Key Deliverables

15-20-page quarterly tracking report in PPT (x3, one for each quarter), for Intelligent Buildings
Quarterly Market & Technology Tracking Outputs & Benefits

Quarterly tracking reports will include a summary of key events, as well as highlights and analysis of the most important events from that quarter.

### Deliverables
- Tracking framework (event types, company types, technologies, etc.)
- 15-20-page powerpoint deck (x3, one for each quarter)
- Excel database of tracked events and related information as available

### Benefits & Values
- Stay up-to-date on ecosystem maneuvers, trends, and investments in the intelligent buildings space
- Track key technology innovations through analysis of M&A and investments
- Leverage graphics and charts from PPT-based trends report in key external presentations
- Focus on topic areas for further research in configured research projects

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**Summaries of Key Events & Macro Trends**

**Individual Event Highlights with Analysis**

**Significant Activity Occurring Across Many Opportunities in Q4 2023**

**Partnerships, Product Announcements & Regulations Summary**

**Acquisitions, Investments & Competitor Announcements Summary**

**Industrial Funding Announcement Highlights**

**Industrial Mergers & Acquisitions Highlights**

**Summary & Takeaways: Industrial Mergers, Acquisitions & Investments**

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2024 IBC Research Services
January 2024
Configured Research Project Overview, Deliverables & Benefits

Through close collaboration with the Steering Committee, Harbor will analyze key topics of interest, producing a PPT-based report that includes re-usable outputs and key recommendations for steering committee members.

**Example Research Topics**

- **Data Analytics & Predictive Maintenance**: How data, analytics, AI, and other technologies can optimize maintenance and prevent downtime.
- **Enhanced Security & Access Control**: Opportunity for technology-enabled security systems including biometrics, facial recognition and AI-power video analytics.
- **Smart Grid Integration**: Collaboration with local utility grids and smart grid technology to optimize energy consumption, enable demand response, and support the integration of electric vehicle charging infrastructure.
- **Flexible Spaces & Workplace Experience**: Technology-enabled and management of flexible and collaborative workspaces to enhance user experience.
- **Building-as-a-Service (BaaS) Models**: Emergence of innovative business models where building services are offered as a subscription or service, providing scalability and flexibility for occupants.
- **Digital Twins and Building Simulation**: Implementation of digital twin technology for real-time simulation, monitoring, and management of building operations, allowing for predictive modeling and optimization.

**Deliverables (x2 configured research reports)**

- 15-25-page powerpoint report on the topic agreed to and as scoped with the steering committee, which could include the following types of output:
  - Market dynamics, trends and forces
  - Technology architecture & landscape
  - Customer needs and buying behaviors
  - Ecosystem, value chain & competitive landscape
  - Market sizing and forecast
  - Strategy recommendations

- Summary infographic for each report

**Benefits & Values**

- Receive data and analysis on multiple topics of interest throughout the year.
- Focus on the topics and workstreams that matter most, and have the flexibility to decide on each topic before it is analyzed.
- Short time to value—receive research and analysis inputs within 8-10 weeks after agreeing to scope.
- Leverage PPT-based material in external presentations.

**Topics Covered in 2023**

**AI Opportunities**

**Sustainability Impact**

**Ecosystems & Interoperability**

---

2024 IBC Research Services
January 2024
Configured Research Project Process

Harbor will conduct 2x configured research projects on topics of interest to the steering committee.

*Draft starting point for Configured Research Process/Approach, to be refined via steering committee meetings*

**Key Deliverables**

- 2x configured research projects, 15-25-page PPT report with 1 summary infographic per report

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**Step 1: Scope Development**
Determine configured research topic and develop scope of work

- Harbor develops a short poll to send the steering committee regarding preferences for configured research project
- Based on responses, Harbor outlines scope for configured research project to present at quarterly steering committee meeting (100 hours of analyst time)

**Step 2: Scope Finalization**
Review scope with steering committee, finalize scope based on feedback

- During quarterly steering meeting
  - Review defined scop with steering committee to field feedback
  - Following the meeting, send steering committee updated scope for final comments and adjustments

**Step 3: Project Execution**
Execute project workstreams

- Configured research project execution
  - Execute configured research project based on scope defined in previous steps

**Step 4: Review & Finalization**
Send draft report for review, finalize based on feedback

- During quarterly steering meeting
  - Review defined scop with steering committee to field feedback
- Following the meeting, send steering committee updated scope for final comments and adjustments

- Harbor sends draft final configured research report to steering committee for review and feedback
- Harbor presents final output from configured research project in next quarterly steering committee meeting
- Send poll for next configured research topic and define scope (as applicable)
Steering Committee Meetings, Interactions, & Example Timeline

With the shortened year, Harbor will hold a total of 6-7 steering committee meetings (1 per month) for Intelligent Buildings, including a kickoff meeting, with the funders of the research engagement. Additional interactions will be provided as well.

**Purpose:** Maintain alignment on scope of work, review completed deliverables, and discuss upcoming activities.

**Agenda (1-1.5 hours depending on the scope of work activities occurring):**
- Introduction, attendance, review of agenda, (5min)
- Review and discuss annual survey (Q1 only, 30min)
- Review current Quarterly Tracking Report (30min)
- Review current Configured Research Project progress (30min)
- Review poll results and proposed scope for upcoming configured research report (20min)
- Wrap-up, actions & Next steps (5min)

*Draft starting point for Steering Committee Meeting agenda and timeline to be refined via steering committee meetings*

**Key Deliverables**

- 6-7 **Steering Committee** meetings, with minutes and recordings
- **1:1 meetings with funders** to understand needs and priorities
- **Final webinar** to review research findings
- **Organization webinars** for each funder to review research findings
- **Think Tank** for ASHB community

**Interaction Timeline**

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<th>MAR</th>
<th>APR</th>
<th>MAY</th>
<th>JUN</th>
<th>JUL</th>
<th>AUG</th>
<th>SEP</th>
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<td>SC Meeting</td>
<td>Final Webinar</td>
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*2024 IBC Research Services*  
*January 2024*
**TEAM & EXPERIENCE:** Harry Pascarella, Vice President, and Dan Chmil, Director of Research, would directly manage these projects. They would be assisted by one of Harbor’s research staff. The entire staff has significant experience analyzing intelligent buildings and connected home opportunities.

**TIMELINE:** Based on the scope described, the engagement would take the form of an extended, ~8-month contract through October 2024. We will work with the funders through steering committee meetings to set and adjust priorities throughout the year.

**NEXT STEPS:** Once this statement of work is agreed to by both parties, we will require 2 weeks to organize our project team ahead of a project kickoff and related work activities. The arrangements for this proposal are valid for 60 days, after which we reserve the right to adjust the arrangements or terms based on the availability of resources and other potential conflicts. We look forward to the opportunity to work together.

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**Who Are We?**
Harbor Research is a consulting, research & venture development firm – we bring together a unique combination of knowledge, processes & skills that enable our clients to succeed in a connected economy.

**What Do We Do?**
The firm partners with clients to design, validate and develop new smart systems and services businesses. Our primary focus is on helping clients develop strategy, define new business models, assist with business and market development plans as well as address the organizational challenges driven by new disruptive growth opportunities.

**What Do We Serve?**
Harbor services the community of emerging technology ventures, diversified product and services companies, global IT and network infrastructure players and capital market constituents.
1. Introduction to Harbor Research
2. Proposed Scope of Work, Process, & Budget
3. Appendix: Examples of Previous Research Experience
Harbor Research Serves Technology Innovators, OEMs & Services Providers

**Illustrative Technology Supplier Clients**

<table>
<thead>
<tr>
<th>Computing &amp; Connectivity</th>
<th>Intel</th>
<th>Samsung</th>
<th>arm</th>
<th>VITESSE</th>
<th>DIGI</th>
<th>SIERRA WIRELESS</th>
<th>eurotech</th>
<th>BSQUARE</th>
<th>LINK LABS</th>
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<td>Qualcomm</td>
<td>NXP</td>
<td>Qualcomm</td>
<td>TELIT</td>
<td>Laird</td>
<td>Wind</td>
<td>FREEWAVE</td>
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<th>Network Infrastructure &amp; Services</th>
<th>orange</th>
<th>verizon</th>
<th>Sprint</th>
<th>INTELSAT</th>
<th>CISCO</th>
<th>Belden</th>
<th>HUAWEI</th>
<th>NOKIA</th>
<th>dura-line</th>
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<td>vodafone</td>
<td>KORE</td>
<td>COX</td>
<td>Motorola Solutions</td>
<td>ERICSSON</td>
<td>CatAmp</td>
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<th>Microsoft</th>
<th>IBM</th>
<th>SAP</th>
<th>ORACLE</th>
<th>Symbion</th>
<th>Mettler-Toledo</th>
<th>TIBCO</th>
<th>MOCA NA</th>
<th>Ayla Networks</th>
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**Illustrative OEMs, Service Providers & Vertical-specific Software Clients**

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<th>United Technologies</th>
<th>Johnson Controls</th>
<th>Club Car</th>
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<th>ClubCar</th>
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Reference Assignments for the Leaders in HVAC, Buildings, Energy & Facilities

Over the last decade, Harbor has executed assignments for a broad cross section of players in the energy, HVAC and facilities arena — below is a representative range of clients we have worked closely with in recent years.

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(Design new energy efficiency business)
(Believes & HVAC Equipment)
Additional Intelligent Buildings & Related Experience

• For a multinational provider of cleaning and hygiene products in the hospitality, healthcare, food and beverage, food service, retail, and facility management sectors, we provided a comprehensive analysis of the ‘Internet of Clean’ sector including key market dynamics, current competitor and peer supplier strategies and maneuvers, as well as competitor solution features & packaging, use cases and services delivery models.

• For the largest social media and networking company in the US, we conducted a demographic research study on a consumer-device prototype to understand the use cases, applications and target constituents in support of a Market Requirements Document.

• For the largest manufacturer of electrical products in North America, we conducted user survey research as well as competitor, peer and alliance candidate direct interviews to uncover unmet customer and user needs for new and evolving “connected” energy management and services opportunities.

• For the global leader in network infrastructure equipment, Harbor conducted an analysis of managed services opportunities in connected residential multi-dwelling and commercial properties, including market sizing, competitor analysis, alliance development analysis and go-to-market design.

• For the world’s largest semiconductor and processor manufacturer, Harbor conducted an analysis of IoT opportunities within the residential sector. Primary emphasis was placed on opportunities where media and content were dominant values to determine core computing and network bandwidth requirements.

• For a venture-backed startup, conducted an analysis of consumer energy services offerings to help target candidate developer alliances as well as partnership opportunities with utilities and related services providers.

• Worked with CABA to develop an opportunity assessment within Connected MDUs, conducting a survey of 1,500 MDU owners, technology suppliers and service providers in the space, including 60 in-depth interviews to validate research findings. The engagement summarized the top IoT application and use case opportunities among primary buyers of technologies in the space, supported by a 5-year smart systems forecast model.

• For a large silicon player, Harbor defined and developed a software architecture for competitive analysis of IoT platforms. This research examined twenty-five supplier and OEM platform providers in the IT, Telco and OEM markets to validate and segment monetization and pricing models.

• For a leading connected lighting solution provider, Harbor defined new and expanded smart services and IoT solutions as well as building the business case required to support this critical growth initiative. Harbor clearly articulated alternative strategies and solutions available to the company and defined clear steps and a program of actions to fully prosecute the market opportunity.

• For the software branch of a leading industrial and energy OEM, Harbor analyzed the costs and economics of asset performance management in support of asset health, productivity, optimization, and compliance and integrity. Harbor developed a market model that broke down the costs of data management and analytics tools, and located gaps the company’s software may not address currently and can be added to the product roadmap.

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Harbor Research has over thirty years of experience working with clients on growth strategy and new business creation. At the core of Harbor’s approach is a deep understanding of the core technologies, markets and business characteristics as well as the management and organizational challenges companies face adopting and developing digital and smart systems technologies. We strive to generate deep insight into how emergent technologies drive value creation and competitive advantage in our clients’ businesses and the economy as a whole.