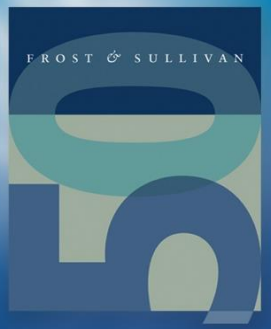
Слагаемые цифровой экономики: Искусственный интеллект, Big Data, кибербезопасность

Форум All -over -IP
22 ноября 2017



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- Более 2000 консультантов-аналитиков в 50 офисах в 30 странах
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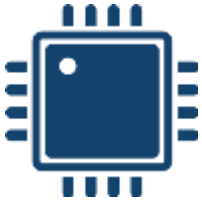
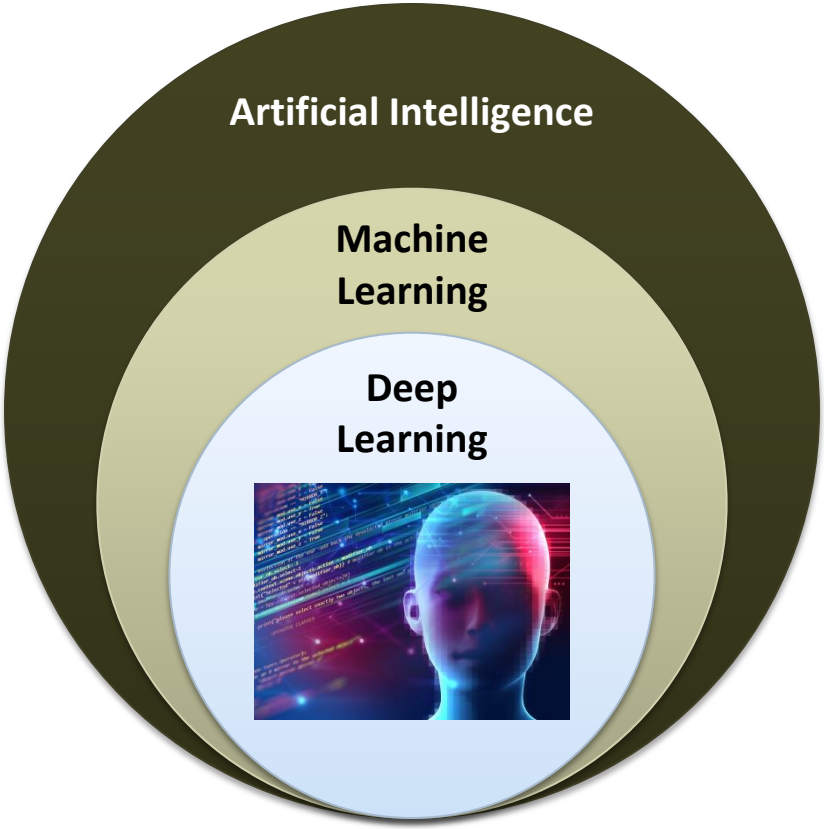


Electronics & Security

Industrial Automation & Process Control

Искусственный интеллект

Technology Overview



Source: Frost & Sullivan

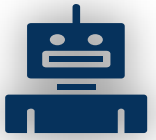
Key Capabilities of AI

Pattern Recognition Identifying Patterns in Historic Data

Natural Language Interaction Simplifying Human-Machine Interactions

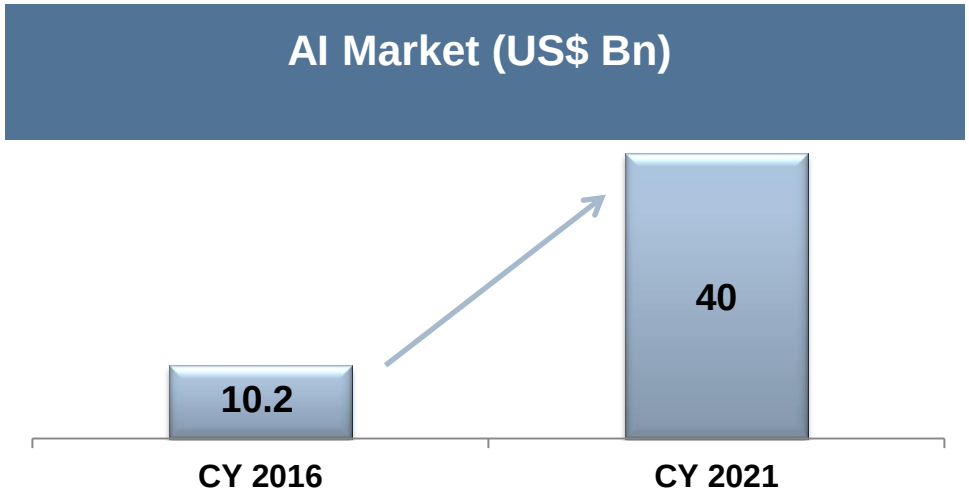
Cognitive Computing Enabling Experiential Learning

Robotics Making Robots Responsive and Reliable



Computer Vision Enabling Machines to Understand What They See

Global AI Market



The need for intelligent automation is driving the adoption of AI across sectors

Текущие применения

- Healthcare
- Banking and Finance
- Retail
- Aerospace and Defence
- Automotive and Transportation

Драйверы роста

- Cognitive Computing
- Neuromorphic Computing
- Quantum Computing
- Exascale Computing

Source: Frost & Sullivan

Deep Learning: Startups Compete with Veterans

IBM Watson performing wonders in Oncology

Google one step closer to true self-learning

Affectiva powering machines to read human emotions

Neurala making smart devices truly autonomous

StatusToday focusing on human behavior analysis

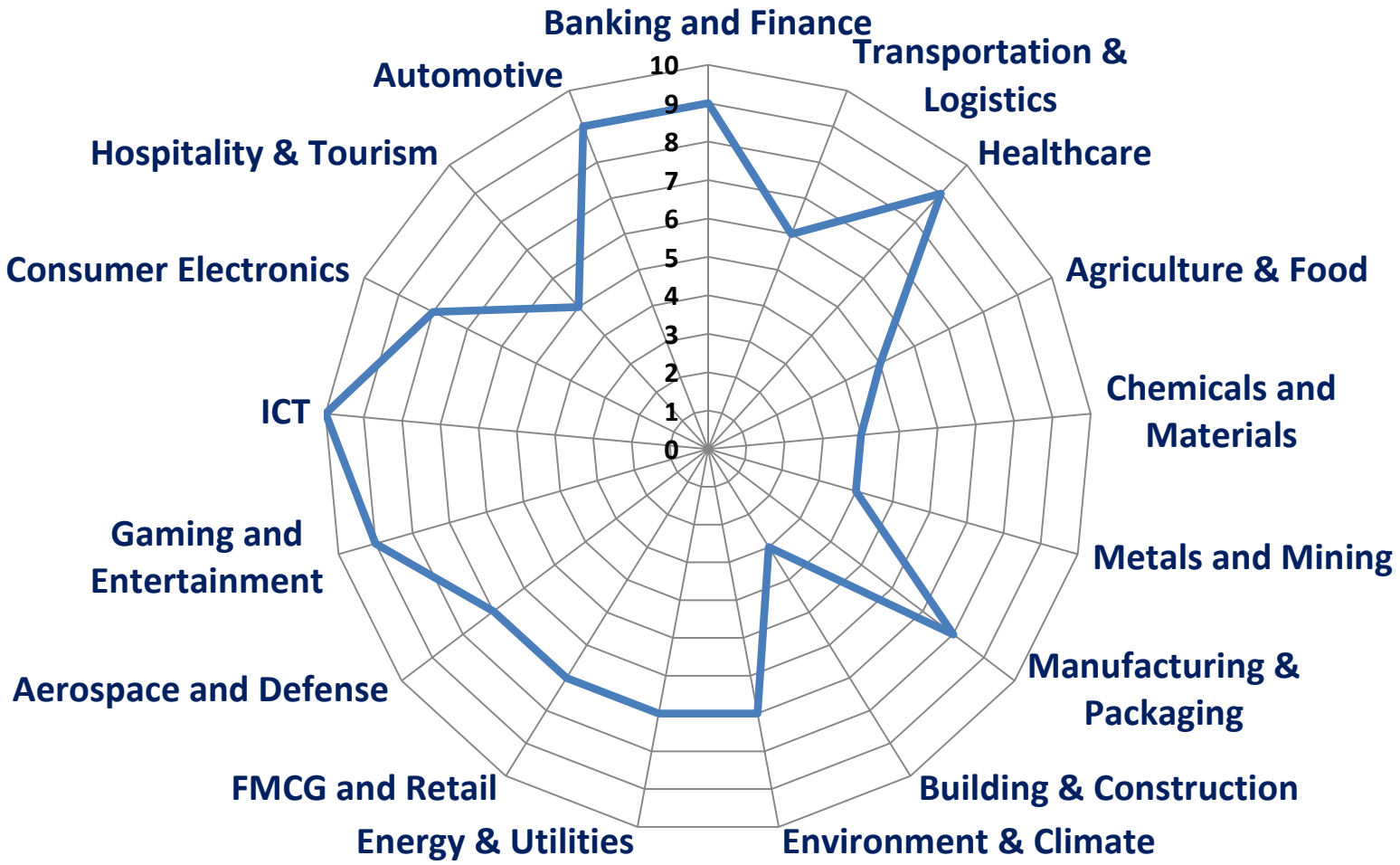
CloudMinds cloudifying AI for robots

Other Innovators :

- Capitali.se
- Gleechi
- Darktrace
- SoftBank Robotics

Source: Frost & Sullivan

AI Impacts Almost Every Sector



**Impact ratings based on evaluation of application disruptive index and year of impact*

Применение AI: IT

Knowledge Management	Cyber Security	Business Intelligence
Starmind (Switzerland) uses proprietary machine learning and artificial neural network technologies to develop an innovative knowledge management solution for enterprises. .	**Deep Instinct (Israel**) has developed proprietary Deep Learning algorithms for endpoint security that identifies network behaviour anomalies and detects the presence of advanced persistent threats (APTs) that traditional reactive perimeter security solutions cannot detect.	**AYLIEN (Ireland**) has emerged as an innovator in enabling BI solutions to extract meaning out of silos of unstructured data.

Other Use-cases:

- **Automated Business Reporting using NLG**
- **Conversational AI Platforms for Virtual Assistants**
- **Cognitive Computing Software Platforms**
- **Cognitive Analytics**
- **Automated Distributed Communication Network Load Balancing**

Применение AI: Банкинг

Automated Stock Trading	Banking Intelligence	Conversational AI for Financial Institutions
Israel-based **Capitali.se** is a fintech company has developed a software platform to support real-time automated financial decisions	**FinGenius** (UK) is dedicated to the development of BI technology platforms for the banking and financial sector.	New York-based **Kasisto** has developed an AI-based conversational platform for the financial sector that successfully powers virtual assistants, smart bots, and other applications with superior intelligence and knowledge—meeting these critical customer interaction needs.

Other Use-cases:

- **Risk Analytics**
- **Profitability Predictions**
- **Automated Pricing and Claim Handling for Insurance**
- **Behavior Analytics Based User Identity Management**

Применение AI: Медицина

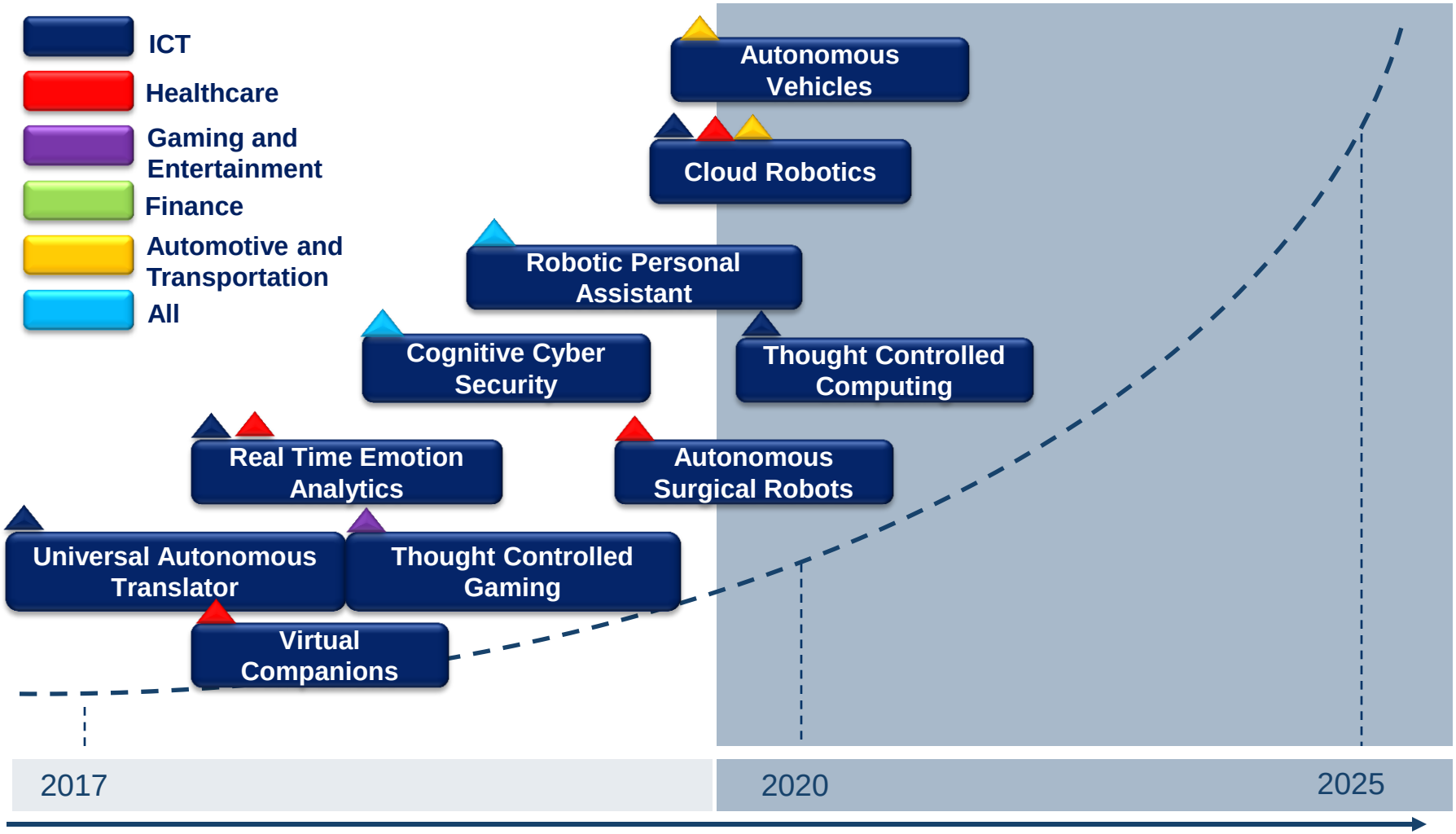
Oncology Diagnosis and Treatment	Mobile Healthcare Triage Platform	Health Event Predictions
• **IBM Watson** is now helping in in providing personalized cancer treatments to patients across the globe by enabling faster and accurate interpretation of genomic testing. • Watson offers highly accurate precision medicine and drug discovery capabilities to facilitate enhanced cancer treatments.	• California-based **HealthTap** is capable of offering accurate treatment recommendations based on various physical symptoms. • The company leverages triage data of over 100,000 doctors to train the AI engine to accurate determine the patients' conditions and seriousness based on detected health patterns.	• **Medable Inc**., headquartered in California, has successfully developed the Cerebrum, a cloud-based machine learning platform that can predict health events that can occur to individuals.

Other Use-cases:

- **Predictive Patient Risk Assessment**
- **Identifying Deep Learned Multi-disease Marker And Classifier**
- **Improve Medication Adherence**
- **Remote Patient Monitoring**
- **Surgical Robots**

Applications Roadmap for AI

AI: Future Roadmap, Global, 2017-2025



Big Data

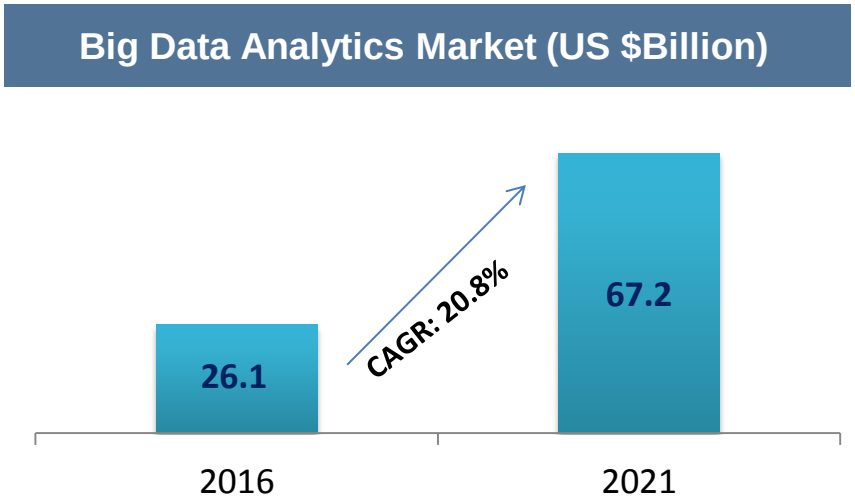
Overview of Big Data

Factors driving technology disruption

- **The Ability to Handle Data Variety**: **IoT** enables a variety of data to be generated from different data sources. Big Data is capable of handling various data types, unlike traditional data management systems.
- **Empowered by Artificial Intelligence** (AI): Advancement in AI in recent years is enabling developers to uncover the hidden relationship between data, thereby significantly facilitating data analytics processes using minimal data input.
- **Availability of Self-service Visualization**: User-friendly dashboards are driving adoption of analytics technology as they reduce complexity for business users as well as negate the need to hire costly skilled resources.

Source: Frost & Sullivan

Big Data Analytics: market trends



- Organizations fuelled with sensor and social data are the early adopters
- Price performance, production forecast, yield optimization, and customer service improvement are some of the widely adopted use cases
- Leading Data Discovery solutions, such as Tableau and Qlik, are enhancing their Advanced Analytics capabilities whereas legacy AA companies, such as SAS and SAP, are introducing their own DDV solutions to provide end-to-end data analytics capabilities.
  Trend of convergence between the 2 segments might lead to acquisitions.

Source: Frost & Sullivan

Innovations in Big Data Analytics

Pentaho is focusing on IoT Analytics

Glassbeam is working on machine data analytics

Splunk uncovers the trend in log files

SAS improves customer interaction

Brandwatch offers social analytics for better engagement

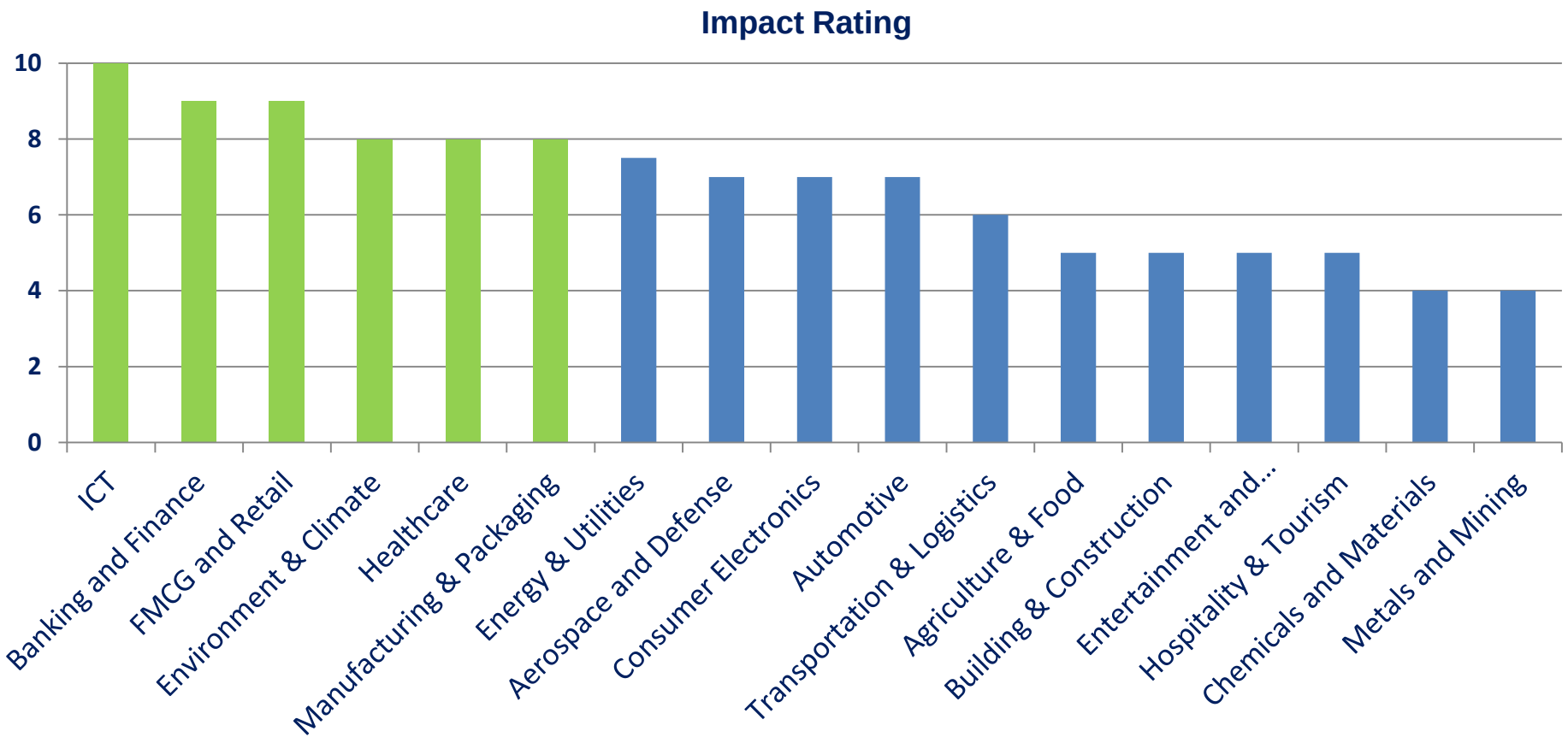
Talend simplifying sensor data analytics

Source: Frost & Sullivan

Other Innovators :

- Microsoft
- XpoLog
- Alteryx
- Sumo Logic

Big Data Analytics impact on industries



**Impact ratings based on evaluation of application disruptive index and year of impact*

Source: Frost & Sullivan

Применение BDA: Финансовый сектор

Fraud Detection

- **MoneyGram** International addresses fund transfer fraud and adhere to compliance regulations.
- Benefits: Ability to detect fraudulent transactions increased by 40%; Reduction in customer complaints by 72%; Saved $37.7 million fraudulent transactions

Personalized Service

- **Aviva** fetches telematics data from drivers' in-built phone GPS to offer lower car insurance premiums to safe drivers.
- Benefits:
  - Drivers save an average of £170 on car insurance if they score 7.1 or more
  - Higher customer engagement

Predict and Prevent Customer Churn

- **Datameer** fetches data from various sources – CRM system, call centers and websites, to draw correlation about customer behavior and predict churn.
- Benefits: A financial services company was able to reduce churn by 50% using Datameer's BDA tool and proactively reaching out to customers

Other Usecases:

- **Compliance Requirements**
- **Customer Segmentation**
- **Real-Time Offers and Portfolio Optimization**
- **Real-time Risk Management**

BDA application: Retail

Sales Forecasting

- **Staples** uses Hadoop BDA solution to process millions of sales transactions every week to predict daily and weekly sales across all retail stores in USA.
- Benefits:
  - Reduction in the sales promotion costs by 25% due to efficient targeted marketing promotions
  - Better customer experience

Inventory Management

- **Tesco** developed a Big Data Analytics model that predicts customers' purchase behavior based on the historical and future weather patterns. Eg. Tesco stocks its stores with barbeque meats if warmer weather is expected.
- Benefits:
  - Cost savings due to better optimization
  - Improved effectiveness of sales offers

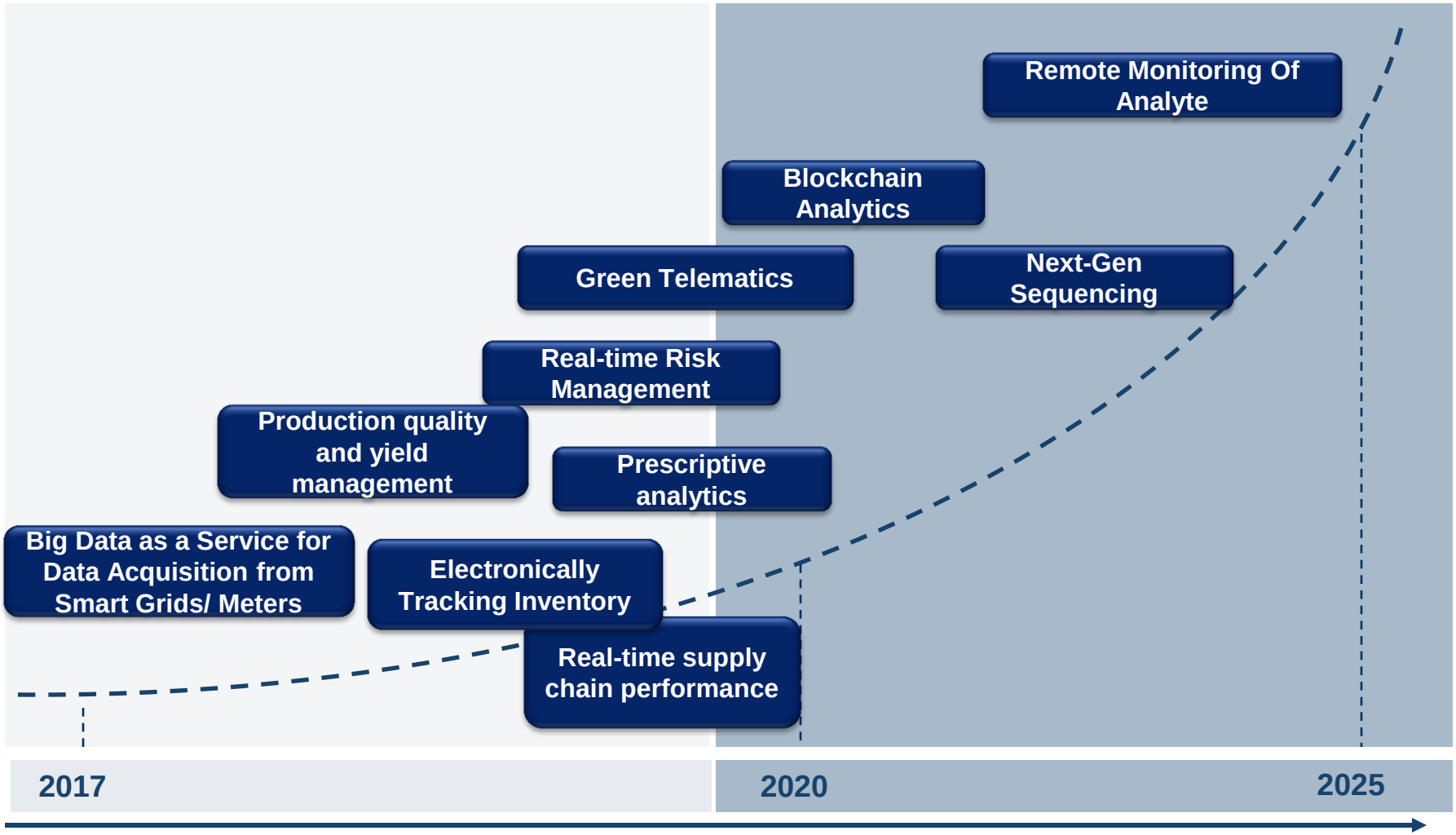
Dynamic Pricing

- **Amazon** has developed a dynamic pricing model that crawls competitors' sites to check their prices and responds by adjusting its own pricing every 2 minutes wherever necessary
- Benefits:
  - Better competitive advantage
  - Improved conversions
  - Enhanced customer satisfaction
  - Increased sales

Other Usecases:

- **Fraud Detection and Prevention**
- **Assortment Optimization**
- **Staff planning and allocation**
- **Placement Optimization**

Application roadmap for Big Data Analytics



Cybersecurity

The average total cost of a data breach increased to $4million in 2016

Key Cybersecurity Predictions

Business Email Compromise (BEC) attacks will overtake Ransomware and Advanced Persistent Threat (APT) attacks

New technologies such as Blockchain may be used to enhance trust between stakeholders and facilitate exchange of threat intelligence among industries:

DDoS attacks hit over 1 Tbps of traffic and shut down several popular online services in 2016. Manufacturers continue to deliver insecure IoT devices to the market

$30 B

The managed security services market will reach $30 billion by the end of 2020

Increased Adoption

- Increasing adoption of BYOD is making it necessary to adopt security solutions.

Source: Frost & Sullivan

Different layers of Cybersecurity

Data Security

Endpoint Security

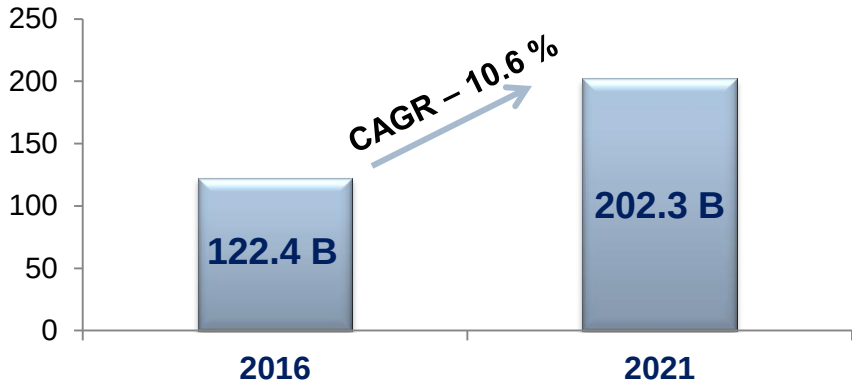
Application Security

Perimeter Security

Network Security

Cybersecurity market trends

Cybersecurity: Global Market, 2016-2021, $ Bn



Market Trends

- **Bring Your Own Device (BYOD)** s are driving the demand

- **Use of biometric security technologies** within security deployments will increase. Key industries such as the banking and finance market will lead the way in the adoption of these technologies
- **Acquisitions remained high** as wider market trends have dictated solutions demand in this evolving space
- **Market entrance is still possible for smaller participants**. The fast-growing success of CyberArk, an Israeli firm which specializes in deploying privileged account management and monitoring solutions, is a testament to the market's open nature.

Source: Frost & Sullivan

Developments More Inclined Towards Machine Learning-based Security Solutions

Cyberbit Machine Learning-based Threat Detection

Status Today provides insider threat protection

Simility Fraud Prevention for Online Banking

BioCatch Physiological Factor-based Behavioral Analytics

Pindrop Fraud Detection for Call Centers

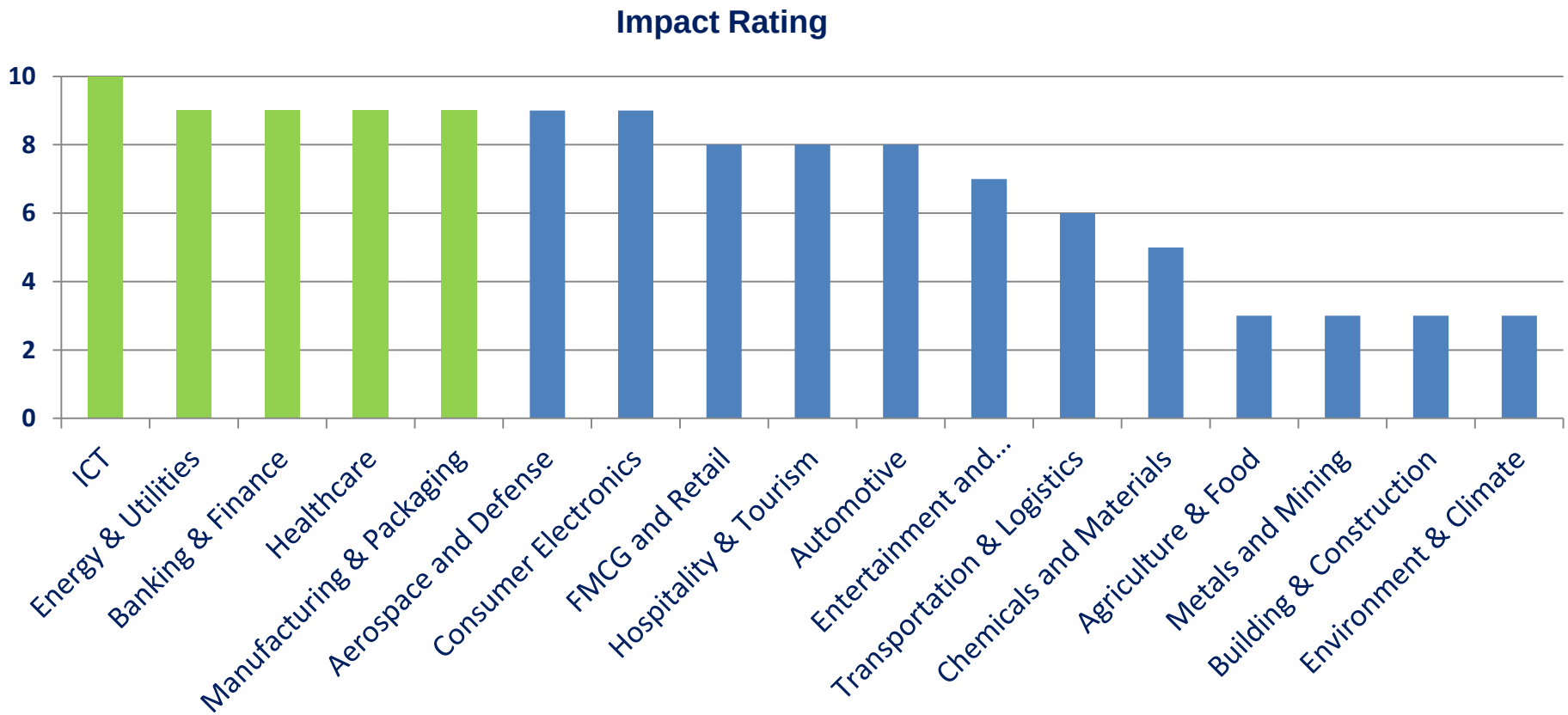
Seclore Secure files where it travels

Other Innovators :

- Niara
- Simility
- Gemalto
- Sekur.me

Source: Frost & Sullivan

Cybersecurity impact on industries



**Impact ratings based on evaluation of application disruptive index and year of impact*

Source: Frost & Sullivan

Применение: ICT

Deep Learning-based Endpoint Security

- Invincea's X is based on a combination of deep learning algorithms and behavioral monitoring to identify and prevent malware right at the offset of attacks. The solution extracts unique file features of applications, which are then analyzed by multi-stage deep learning algorithms to check the similarities with other malware families within 20 milliseconds.

Network Security Support for Cloud Servers and Endpoints

- Ziften's ZFLOWTM system provides greater network visibility by providing user behavior analysis using contextual intelligence. This solution can be easily integrated into previously installed security tools. This solution provides real-time visibility and intelligence by examining endpoint and cloud server behavior continuously. It further highlights anomalies, which helps to tackle advance threats faster and minimize time taken to resolution.

Attack-agnostic Threat Prevention

- The Morphisec Endpoint Threat Prevention solution leverages proprietary Moving Target Defence (MTD) technology that helps to morph the runtime environment for applications and OSs by scrambling the inner structure of the processes, making the memory space unpredictable for tracing by attackers.

Other Usecases:

- **Enterprise Mobile Threat Protection**
- **Behavior-based Threat Protection**
- **Intelligent Multi-layered Endpoint Security**
- **Machine Learning-based Fraud Detection**

Применение: Энергетика

Centralized View of Network	Vulnerability Assessment of Endpoint Devices	Multi-dimensional Protection System
• Tenable Network Security offers a portfolio of products that provide a comprehensive view of the SCADA network. It's SecurityCenter Continuous View (CV) solution delivers a centralized view of the complete network.	• The N-Sentinel Vulnerability Assessment tool offered by N-Dimension Solutions Inc., delivers an on-demand assessment for endpoint devices that are connected to the grid network. It helps in detecting the latent vulnerabilities in the device operating systems and the applications that are installed into the device.	• Cisco's Grid Security system covers an extensive set of functionalities that provide all around protection for the grid system. The system's Identity Management and Access Control Module is customized for grid control.

Other Usecases:

- **Critical Asset Protection**
- **Intrusion Detection and Security Monitoring**
- **Energy Grid Management**
- **Regulatory Compliance and Assessment**

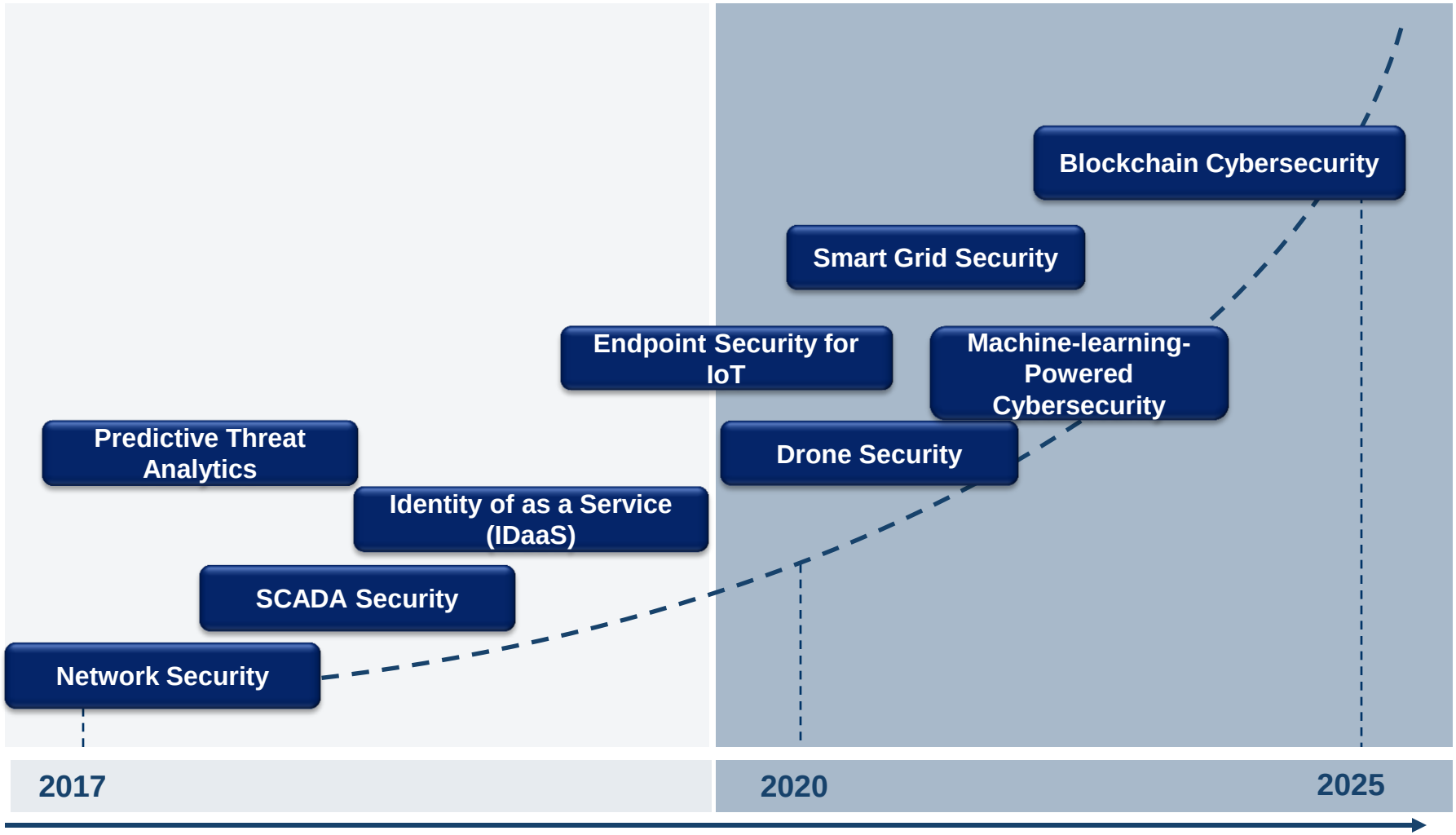
Применение: Smart Banking

Network Threat Prevention	Endpoint Security Protection	Host-based Intrusion Detection
• **Citizens National Bank of Texas** used basic security techniques like firewalls, email gateway and anti-virus solutions. However, these are only reactive in dealing with cyber attacks. The bank wanted to proactively address Cybersecurity threats in future. • Benefits: Proactively countered Cyber threats without much disruption to user activity; Many threats that could have eluded previously were addressed	• **New York Bank**, one of largest commercial banks in US, was struggling to have a good visibility on the security of its enormous network of endpoints. • Benefits: Since the solution is agentless, it avoids the complications related to installing multiple agents on various devices; Faster reporting on number of USB ports and their location	• **Bank of Marin**, a leading bank in the San Francisco Bay Area wanted to increase an additional security layer to its existing program in order to increase network visibility • Benefits: Cost effective compared to other solutions from Palo Alto, FireEye and Carbon Black; Increased visibility of bank's network

Other Usecases:

- **End-to-End Fraud Prevention for Online Banking**
- **Point-to-Point Encryption for Payment Security**
- **Threat Detection Leveraging User Behavior Analytics**
- **E-mail Data Intelligence to Identify Fraud Risk**

Application roadmap for Cybersecurity



Примеры клиентских проектов Frost & Sullivan

Case Study 1: Roadmap for AI Technology in Taiwan

The Client: An Institute associated with the Taiwan Government

The Challenge

Impact and assessment of artificial intelligence (AI) and its sub technologies current capabilities in healthcare practices, especially in robotic surgery arena. Identify key pain-points/limitations/challenges and review recent developments in AI technology to realize the end functionalities applications in that space.

Project Objectives

- Detailed analysis of companies / organizations active in AI application development for surgical robots
- To review advances in artificial intelligence with respect to healthcare applications
- Technology readiness level for AI sub-technologies and development roadmap for the AI technology with key breakthroughs in robotic surgery space.

Our Approach and Work

- The top global organizations carrying out R&D in the particular AI technology was identified via extensive secondary research
- Frost & Sullivan conducted interviews with the key researchers associated with the respective technology and extracted detailed information on the technology and market aspects.
- Information compiled during the secondary research phase was validated and expanded during the primary interview stage

Outcome and Business Impact

- Frost & Sullivan delivered primary interviews with global researchers, which revealed technical details as requested by the client and the information was used by the client to for their strategic R&D decision making
- The information will help client to identify the steps to be taken to elevate the current market to a futuristic application scenarios in healthcare sector.
- The outcome provided comparative assessment of AI Technology maturity and its adoption at a global scenario and in Taiwan.

Case Study 2: Global technology and market assessment for 4 emerging technologies including ICT-enabled Robotics, Artificial Intelligence, Wavefront Control, and 2D materials

The Client: A South Korean government organization

Our Approach and Work

- IP analysis was carried out using the Thomson Innovation database to identify the key assignees of patents, the historical trends, and the country-based IP filing patterns
- Primary interviews was done with global experts in the 4 sectors to validate findings.
- An assessment of the global R&D trends, regulatory framework, funding trends, and major application sectors for these 4 technologies was performed.
- An assessment of the global market sizing and growth was completed.

Outcome and Business Impact

Frost & Sullivan provided strategic recommendations on which R&D areas should be focused upon, based on the global assessment, and the existing competence within South Korea.

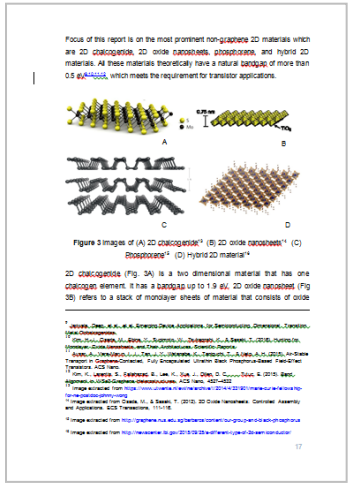
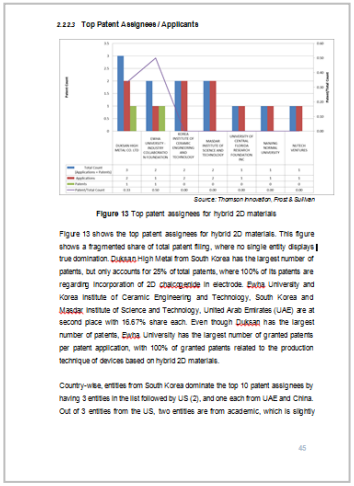

Focus of this report is on the most prominent non-graphene 2D materials which are 2D chalcogenide, 2D oxide nanosheets, phosphorene, and hybrid 2D materials. All these materials theoretically have a natural bandgap of more than 0.5 eV,[1][2][3][4], which meets the requirement for transistor applications.

Figure 3 Images of (A) 2D chalcogenide*1 (B) 2D oxide nanosheets*1 (C) Phosphorene*2 (D) Hybrid 2D material*4

2D chalcogenide (Fig. 3A) is a two dimensional material that has one chalcogen element. It has a bandgap up to 1.9 eV. 2D oxide nanosheet (Fig 3B) refers to a stack of monolayer sheets of material that consists of oxide

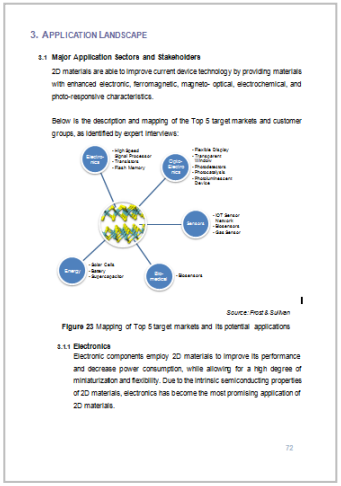

2.2.2.3 Top Patent Assignees / Applicants

Source: Thomson Innovation, Frost & Sullivan

Figure 13 Top patent assignees for hybrid 2D materials

Figure 13 shows the top patent assignees for hybrid 2D materials. This figure shows a fragmented share of total patent filing, where no single entity displays true domination. Duksan High Metal from South Korea has the largest number of patents, but only accounts for 25% of total patents, where 100% of its patents are regarding incorporation of 2D chalcogenide in electrode. Ewha University and Korea Institute of Ceramic Engineering and Technology, South Korea and Masdar Institute of Science and Technology, United Arab Emirates (UAE) are at second place with 16.67% share each. Even though Dukasn has the largest number of patents, Ewha University has the largest number of granted patents per patent application, with 100% of granted patents related to the production technique of devices based on hybrid 2D materials.

Country-wise, entities from South Korea dominate the top 10 patent assignees by having 3 entities in the list followed by US (2), and one each from UAE and China. Out of 3 entities from the US, two entities are from academic, which is slightly


3. Application Landscape

3.1 Major Application Sectors and Stakeholders

2D materials are able to improve current device technology by providing materials with enhanced electronic, ferromagnetic, magneto- optical, electrochemical, and photo-responsive characteristics.

Below is the description and mapping of the Top 5 target markets and customer groups, as identified by expert interviews:

Source: Frost & Sullivan

Figure 23 Mapping of Top 5 target markets and its potential applications

3.1.1 Electronics

Electronic components employ 2D materials to improve its performance and decrease power consumption, while allowing for a high degree of miniaturization and flexibility. Due to the intrinsic semiconducting properties of 2D materials, electronics has become the most promising application of 2D materials.

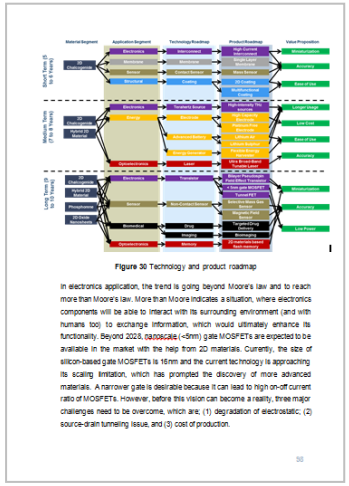
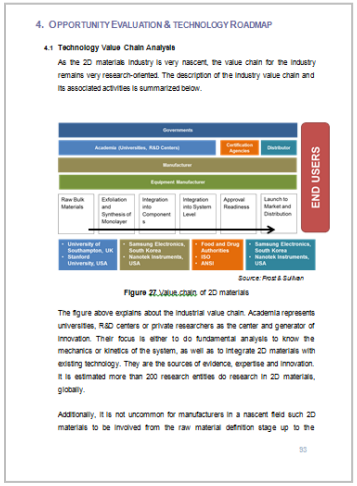


Figure 30 Technology and product roadmap

In electronics application, the trend is going beyond Moore's law and to reach more than Moore's law. More than Moore indicates a situation, where electronics components will be able to interact with its surrounding environment (and with humans too) to exchange information, which would ultimately enhance its functionality. Beyond 2028, nanosheet (~5nm) gate MOSFETs are expected to be available in the market with the help from 2D materials. Currently, the size of silicon-based gate MOSFETs is 16nm and the current technology is approaching its scaling limitation, which has prompted the discovery of more advanced materials. A narrower gate is desirable because it can lead to high on-off current ratio of MOSFETs. However, before this vision can become a reality, three major challenges need to be overcome, which are; (1) degradation of electrostatic; (2) source-drain tunneling issue, and (3) cost of production.


4. Opportunity Evaluation & Technology Roadmap

4.1 Technology Value Chain Analysis

As the 2D materials industry is very nascent, the value chain for the industry remains very research-oriented. The description of the industry value chain and its associated activities is summarized below.

Source: Frost & Sullivan

Figure 27 Value chain of 2D materials

The figure above explains about the industrial value chain. Academia represents universities, R&D centers or private researchers as the center and generator of innovation. Their focus is either to do fundamental analysis to know the mechanics or kinetics of the system, as well as to integrate 2D materials with existing technology. They are the sources of evidence, expertise and innovation. It is estimated more than 200 research entities do research in 2D materials, globally.

Additionally, it is not uncommon for manufacturers in a nascent field such 2D materials to be involved from the raw material definition stage up to the

Case Study 3: Assessment of 15 Emerging Industries for a state government including IoT, Commercial Drones, Robotics, Smart Homes, and Big Data Analytics

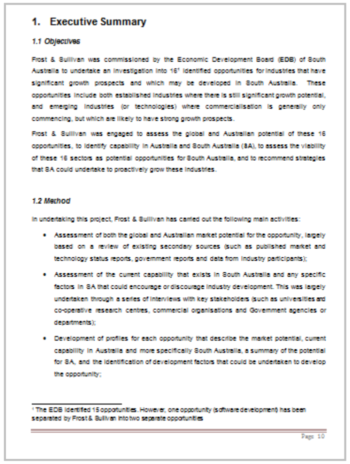
The Client: An Australian state government

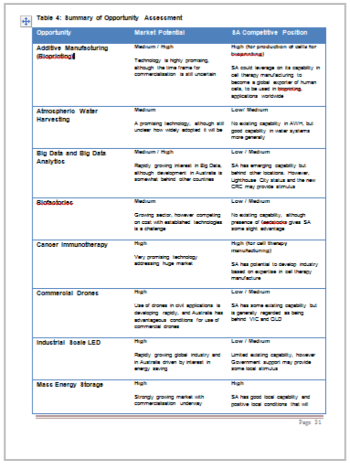
Our Approach and Work

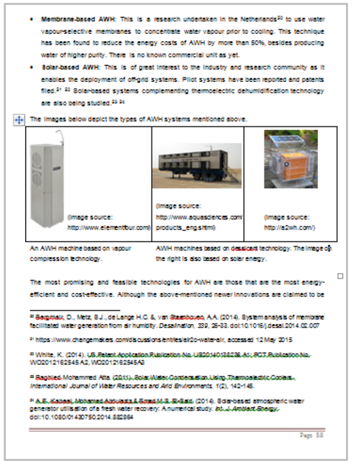
Frost & Sullivan researched and profiled the 15 identified future industries, based both on research from secondary data sources and primary research to identify and assess existing capability in Australia which could be further developed. Based on the research, the opportunities were screened using the criteria of Market Potential and Client’s Ability to Compete. A short-list of five opportunities was developed, and initial development road-maps were produced

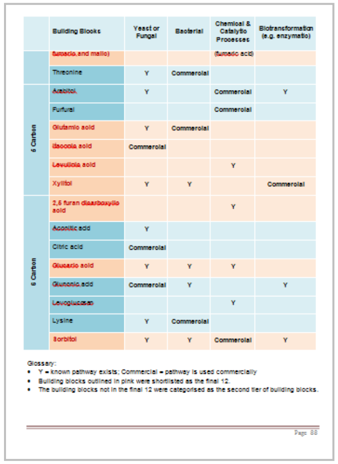
Outcome and Business Impact

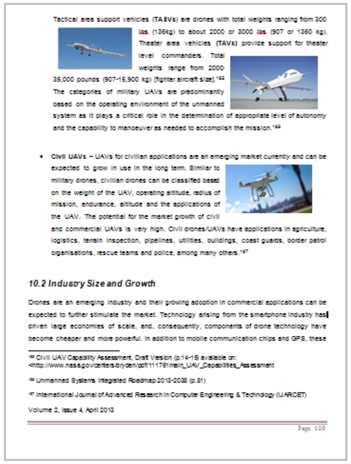
Frost & Sullivan identified a short-list of future industries for the client that have a combination of good market potential and where the client has a realistic opportunity to build and develop an industry. These opportunities are being further assessed via the development of more detailed road maps











Case Study 4: Assessment of 8 emerging industries for an economic promotion agency including Virtual Reality, Cybersecurity, Robotics and Health IT

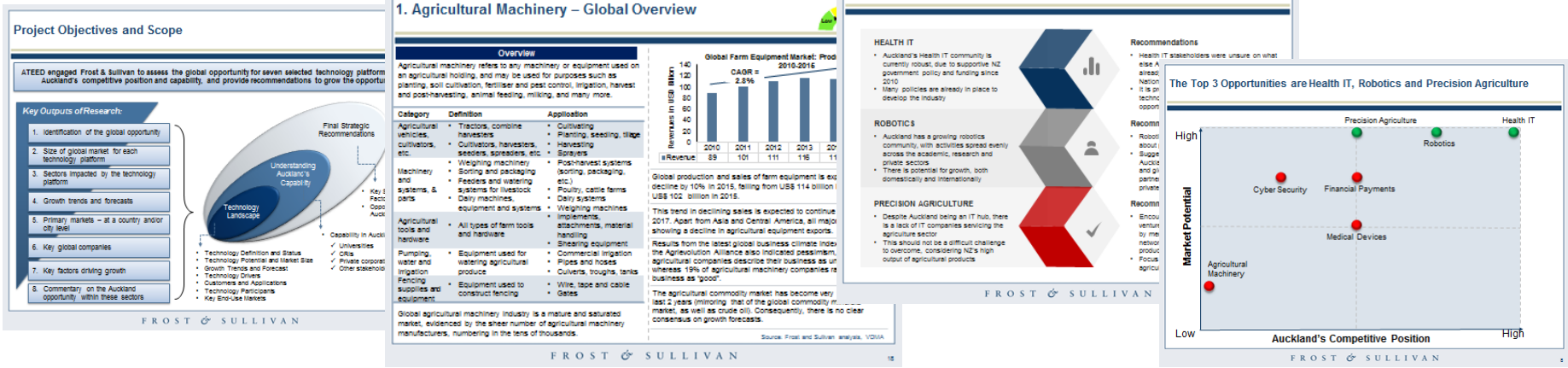
The Client: A New Zealand economic promotion agency

Our Approach and Work

Frost & Sullivan researched and profiled the 8 identified emerging industries, which included identification and assessment of existing capability in Auckland and New Zealand, leveraging both secondary and primary data sources. Based on the research, the opportunities were assessed using the criteria of Market Potential and Client's Ability to Compete. The 8 emerging industries included robotics, precision agriculture, augmented / virtual reality, cybersecurity, financial payments, agricultural machinery, health IT, and medical devices.

Outcome and Business Impact

Frost & Sullivan identified a short-list of future industries for the client that have a combination of good market potential and where the client had a realistic opportunity to build and develop an industry. The project is a recurring one, as Frost & Sullivan continues to provide support, as and when the client identifies new industries to be assessed.



Case Study 5: Global technology and market assessment for 3 emerging technologies including Immersive Computing, Brain Computer Interface, and Health Informatics

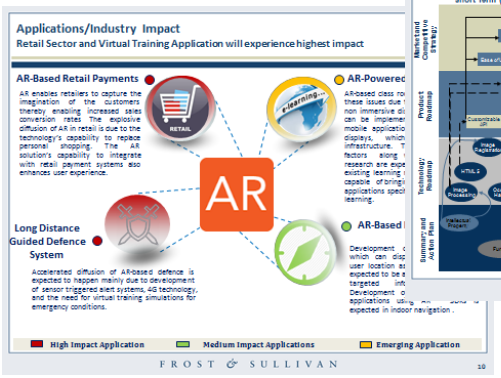
The Client: A South Korean Government Ministry

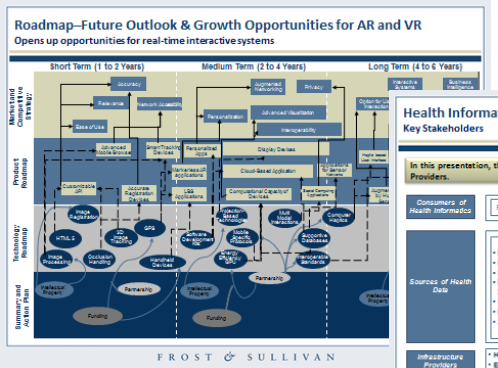
Our Approach and Work

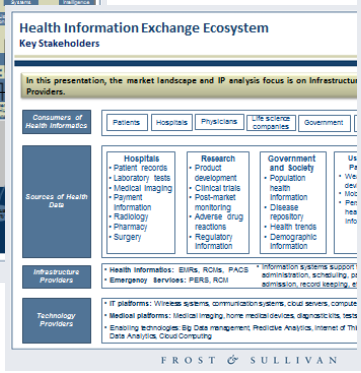
- The TechVision group in Frost & Sullivan leveraged information from their annual Top 50 Technologies programme, which represents a very selective collection of emerging and disruptive technologies that are expected to shape the world in the near future. Consequently, an assessment of the 3 emerging technologies were carried out both at a global level and for South Korean stakeholders, where the South Korean stakeholders were ranked against their global competitors.
- For the working trip, representatives from the South Korean Ministry were escorted to Singaporean government agencies that are involved in research and technology commercialization.

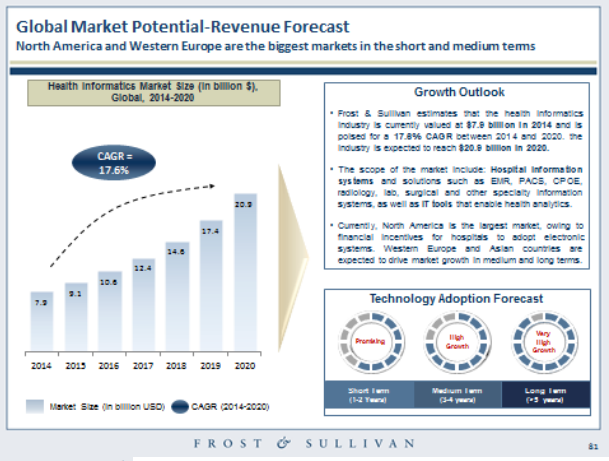
Outcome and Business Impact

The final assessment included recommendations for areas of R&D focus for the Ministry, within the 3 emerging industries selected. Representatives from the Ministry were also very satisfied with the learnings from the Singaporean working trip.









Case Study 6: Assessment of Advances in Robot Technology and Artificial Intelligence for Surveillance and Maintenance

The Client: A leading oil & gas company

The Challenge

- Identify and review recent developments in the area of robotics that have potential applications in their industry for surveillance, maintenance, safety and reliability improvement of the surface facilities in oil and gas production

Project Objectives

- To review advances in robotics and artificial intelligence
- To identify and provide a summary of leading research institutes, universities and private organizations that are actively working in this area

Our Approach and Work

- Frost & Sullivan created a team of emerging technology analysts to evaluate the designated technology area.
- Exhaustive secondary research of open literature was followed by a series of interviews with individuals and organisations involved in research, development, and production of these platform robotic technologies in the commercial, academic, government and end user levels.

Outcome and Business Impact

Frost & Sullivan delivered a detailed report describing various emerging robotics technologies that are to be deployed in advanced industrial applications, deep sea exploration, maintenance, nuclear and military applications and also recommended the most suitable technologies for the client.

Методология Frost & Sullivan для оценки прорывных технологий

Application Impact Across Industry Sectors – Evaluation Approach

1 Application Disruptive Index

- Application Disruptive Index score reflects the "disruptiveness" potential of a technology with respect to each of the industry sectors listed. The higher the degree of change attributed to the technology, the higher the ranking assigned to it. Gradual disruptiveness are assigned to the sectors where there is minimal potential disruption to incumbent businesses, while step-changing innovations are those that are likely to facilitate significant performance improvements and cost benefits. Game changing innovations are those that offer completely transformational approach to businesses and create new avenues for growth in the respective industry sectors. This is measured on a scale of 5.

2 Year of Impact

- Year of Impact represents the potential impact timing over a period of 5 years. Short term reflects that the impact is likely to be noted over the next 2 years, while medium term represents that the impact is likely to be noted in about 3-4 years from now and long term refers to impact, which is to be seen in around 5 years or above. This is measured on a scale of 5.

3 Application Impact Rating

Application Disruptive Index + **Year of Impact**

4 Industry Sectors Considered

- Aerospace and Defense
- Agriculture & Food
- Automotive
- Banking & Finance
- Building & Construction
- Chemicals and Materials
- Consumer Electronics
- Energy & Utilities
- Entertainment and Education
- Environment & Climate
- FMCG and Retail
- Healthcare
- Hospitality & Tourism
- Information and Communication Technology (ICT)
- Manufacturing & Packaging
- Metals & Mining
- Transportation & Logistics

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