Next Generation Sequencing Informatics Markets

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Personalization, Communication, Decentralization, Collaboration

From...

One Size Fits All
Fragmented, One-way
Provider Centric
Procedure-based
Centralized, Hospital-based
Fragmented, Specialized
Based on Individual Expert
Treating Sickness

...To

Personalized Medicine
Integrated, Two Way
Patient Centric
Bundled, Capitated
Decentralized, Community-based
Collaborative, Shared Information
Based on Protocols and Analytics
Preventing Sickness (Wellness)

Source: Frost & Sullivan
Healthcare Re-imagined

In Person
Reactive
Break-Fix

In Home
Semi-reactive
Connected

Preventive
Predictive
Monitored

Precision
Prescriptive
Streaming
One Size Doesn’t Fit All

Precision Medicine

The Promise

Is there a need?

Key Trends

• Adverse and severe side effects to drugs.
• Increasing costs of healthcare
• Increased remote access of patient condition and point of care diagnostics
• Screening and early detection of diseases

Influential Sectors

Developments: Now & Future

• Falling cost of genome sequencing and next generation technology with high throughput capability.
• Enables personal genomics to create databases of genomic profiles of patients.
• Increase efforts to develop point of care devices that have mobile communication capability to enable rapid testing and rapid intervention.
• Escalation in development of more robust drugs based on pharmacogenomics and stem cells modeling innovations.

Genomics

Biomarkers

Proteomics

F R O S T & S U L L I V A N
Genomics Is Part of the Shift to Precision Medicine

- Genetic profiles will guide physicians to select conducive therapies and drugs for patients.
- Aid in easily assessing an individual's propensity to contracting certain diseases.
- Technology advancement in instrumentation is also boosting the capability of personalized drug development.

Some Key Players: Roche Diagnostic, Life Technologies, Bio-Rad Labs

- Development of targeted therapies that look into inhibiting cancer causing proteins or induce cell death in tumors.
- Proteomics is also being used to assess how well patients will react to certain therapies using imaging mass spectrometry.

Some Key Players: Norvartis, Applied Proteomics, Proteome Sciences

- Biomarkers are increasingly being used in drug discovery process and some pioneering companion diagnostics.
- R&D efforts in molecular biology have generated numerous medical projects which are all aiming at detecting and defining biomarkers that are clinically useful.

Some Key Players: Oxford Cancer Biomarkers, Pacific Biomarkers, Myriad
Dealing With Huge Volumes of Data To Get Answers

With 5,400 petabytes of raw data from next generation sequencing to be stored by 2018, cost effectively storing and making this data accessible to clinicians and researchers will require cloud solutions

Not if, but when…

“Within ___ years, it will be considered malpractice to treat a patient without consideration of their individual –omics data”

Source: Frost & Sullivan analysis
Change, By the Numbers
Decreasing Sequencing Costs and Increasing Clinical Applications Driving Market Shifts

>65% of NGS informatics revenues come from translational biomedical research organizations
  • academic institutions
  • government agencies
  • biopharma companies

Customers remain incredibly fragmented in terms of their applications, pipelines, and NGS informatics needs

Percent Revenue by Product Segment, Global, 2012

- Commercial biological interpretation and reporting tools, 14.7%
- Computing, 16.2%
- Storage, 17.6%
- Commercial primary and secondary data analysis tools, 19.1%
- NGS informatics services, 23.5%
- LIMS, 8.8%

Source: Frost & Sullivan
Wide Range of Market Participants

The competitor base will shrink as vendors with “me too” solutions begin exiting the market.

Vendors must overcome the challenge of customers’ reliance on internal bioinformatics resources.
Breakdown by Product Segment Provides Another View

Storage and Computing Tools
- EMC²: $30 million
- Amazon Web Services™: $28 million

Cloud-based Primary & Secondary Data Analysis Tools
- $33 million

Shrink-wrapped Primary & Secondary Data Analysis Tools
- $25 million

NGS Informatics Services
- $40 million

LIMS
- $15 million

Sequencing Technologies
- $400 million*

Commercial Biological Interpretation and Reporting Tools
- $25 million

*iNGS Instrument revenues were not included in the NGS Informatics market revenues
## Total NGS Informatics Market: Global, 2012

<table>
<thead>
<tr>
<th>Market Stage</th>
<th>Market Revenue</th>
<th>Market Size for Last Year of Study Period</th>
<th>Compound Annual Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emerging</td>
<td>$170 M</td>
<td>$580 M</td>
<td>22.7%</td>
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</table>

<table>
<thead>
<tr>
<th>Average Informatics Cost Per Sample</th>
<th>Customer Price Sensitivity</th>
<th>Degree of Technical Change</th>
<th>Average New Product Release</th>
</tr>
</thead>
<tbody>
<tr>
<td>~100</td>
<td>8</td>
<td>10</td>
<td>10 per year</td>
</tr>
<tr>
<td>Commercial costs only</td>
<td>(2012; scale:1 [Low] to 10 [High])</td>
<td>(2012; scale:1 [Low] to 10 [High])</td>
<td>(2012)</td>
</tr>
</tbody>
</table>

$170 M Market Revenue (2012)  
$580 M Market Size for Last Year of Study Period (2018)  
22.7% Compound Annual Growth Rate (2012-2018)  

~100 Market Competitors (2012)  
$115 Average Informatics Cost Per Sample (2012)  
8 Customer Price Sensitivity (2012; scale:1 [Low] to 10 [High])  
10 Degree of Technical Change (2012; scale:1 [Low] to 10 [High])  
10 per year Average New Product Release (2012)

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan
NGS Informatics Tools for Biological Interpretation and Clinical Reporting Will Drive Market Growth

- Primary and secondary data analysis tools are likely to become commoditized as pipelines grow more standardized

- The drive to bring NGS into the clinical setting drives the high-value components of NGS informatics

Source: Yale University; Frost & Sullivan


**BGI’s Large Role in the NGS Informatics Market Boosts Asia’s Revenue Share**

<table>
<thead>
<tr>
<th>Headquarters</th>
<th>Shenzhen, China</th>
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<tbody>
<tr>
<td>Founding Year</td>
<td>1999</td>
</tr>
<tr>
<td>Key Product</td>
<td>Services</td>
</tr>
<tr>
<td>Employees</td>
<td>~4,000</td>
</tr>
<tr>
<td>Revenues (2012)</td>
<td>~$200 million</td>
</tr>
</tbody>
</table>

- BGI is the world’s largest commercial sequencing services provider, producing ~15% of the world’s sequence data.
- BGI employs >1,000 bioinformaticists, and is able to outperform its competition in services pricing.
- In September 2012, BGI acquired Complete Genomics.
- Outside of China, BGI has satellite labs in Denmark, Philadelphia (CHOP), and Sacramento (UC Davis).

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**Total NGS Informatics Market: Percent Revenue by Region, 2012**

- **North America**, 39.6%
- **Europe**, 32.4%
- **Asia**, 22.2%
- **Rest of world**, 5.8%

Note: All figures are rounded. The base year is 2012. Source: Frost & Sullivan
We Are At a Key Inflection Point, The Only Debate is How Fast

Genetic Testing Adoption Curve

Current market status

Early Stage: A lack of infrastructure, clinical evidence and physician education limits integrating genetic services in clinical care

Moderate Adoption: Clinical utility established for certain therapeutic areas. Bioinformatics still remains a bottleneck

High Adoption: Established clinical utility across many therapeutic areas with genetic testing. Greater availability of established data and informatics to create valuable analysis

Key drivers of adoption of genetic testing into the common practice include the following:

- Regulatory and legal landscape
- Test technology
- Reimbursement, or proven health economics
- Physician adoption
- Bioinformatics platforms
- Consumer demand

Source: Frost & Sullivan analysis.
Impact of Genetic Testing Beginning to Be Felt

Advances in NGS instrumentation, personalized genomic tests and esoteric lab services have advanced the industry.

1. Genetic predispositions of diseases acquired and inherited
2. Genetic screening tests for early stage cancer detection
3. Aid in drug discovery and development for rare diseases

Global distribution of gene test developers

- North America: 53%
- Europe: 21%
- Asia: 16%
- Australia: 10%

Company distribution by Types of Tests

- GWAS: 30
- Lifestyle & behavioral: 15
- Ancestral & Family Tree: 90
- Pharmacogenic: 40
- Nutrigenomic: 45
- Predisposition: 20
- Carrier: 45
- Prenatal: 50
- Diagnostic: 70

Frost & Sullivan
Pathology reports integrate a combination of pathologic and genomic information

Payers (and healthcare providers under risk-based contracts) accept clinical and cost ROI

Consumers push governments and payers to adopt genomics as standard of care

Software in an average genetics lab grows from 5–10% of the lab’s budget to 20–30% due to value associated with clinical interpretation and reporting

Vendors provide more than tools – they assist in successful process change, coordinate workflows and customize solutions
Capturing the Value from Data Growth in Clinical Utility

- Beyond data integration to clinical integration
- It’s not about the app, the interface, or even the analytics – it’s how clinicians use the knowledge
- The biggest gap to be breached is not in creating more data and analytics, it is in transforming the process of providing healthcare
What Will The Future Look Like?

- Healthcare increasingly data driven and customized
- Healthcare more like other service industries
- Globalized care delivery
- New care models focused on collaboration, information exchange / awareness, achieving health outcomes, especially with chronic disease care
- Increased development of standards of care and incentives to adopt them
- Personalization of treatment, interaction, coverage
- Increased patient engagement to manage disease via remote monitoring and mobile apps

- Increased leveraging of technology and non-physicians
- More “generics” – technologies providing same value at lower price, stripped down feature sets
- Increased use of analytics to define care pathways
Thank You

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