Trends in the pharmaceutical industry
The great success of blockbuster model delayed need for cost optimizations

- The global blockbuster market has historically experienced high growth rates (1994-2000 CAGR: 23.6%). Such success underpins the overall revenue performance of most of the companies that currently market blockbusters. Blockbusters offer higher returns than their lower value counterparts relative to the substantial risks, time and costs involved in product development and commercialization.

- This boost in added value experienced by the pharmaceutical industry is only a temporary effect; as the blockbusters that have driven the value growth are heading towards their end of patent protection, industry value will drop back to restore overall trend levels.

Source: Datamonitor, Arthur D. Little analysis
Historically, the pharmaceutical industry business models have been largely based on Fully Integrated Pharmaceutical Companies.

Current positioning of traditional players on the industry value chain

Source: Arthur D. Little

1): CMOs : Contract Manufacturing Organizations, 2): CROs : Contract Research Organizations
Traditional players value creation is based on intellectual property supported by Patents which determined the drugs’ life cycle and the key parameters to be optimized...

### Major parameters of drug life cycle

- **Time-to-Market**
- **Time-to-Competition**
- **Time-to-Profit**
- **Time-to-Peak-Sales**
- **Time-to-Patent Expiry**
- **Time-to-Collapse**

### Milestones

- Go
- Launch
- 'Me-too' product
- Generics’ entry

Source: Arthur D. Little
…and pharmaceutical companies have managed to optimize the lifecycle!

Major parameters of drug life cycle

1) Reduced Time-to-Market
2) Reduced Time-to-Peak Sales
3) Favorable impact on Time-to-Profit
4) Increased Peak Sales
5) generic entry

Time-to-Collapse

Source: Arthur D. Little
The pharmaceutical industry business models is increasingly modular: specialists capture some of the value

Source: Arthur D. Little

1): CMOs: Contract Manufacturing Organizations, 2): CROs: Contract Research Organizations
The typical economics of a Pharma company

1. SALES: 100%
2. COST OF GOODS: (20-25%)
3. MRKT & SALES: (25-35%)
4. R/D: (25-20%)
5. ADMINISTRATION: (8-10%)
6. FINANCE: (2-3%)
7. PROFIT BT: 20-7%
There are essentially four forces at play impacting value creation:

**SCIENCE**
- Growth of biotech
- Importance of vaccines
- Higher risk of pandemic (global warming)

**TECHNOLOGY**
- Increased technology integration
- Innovation is becoming more complex
- Increased formation of partnerships

**MARKET**
- End of the blockbuster products
- Increasing importance of niche marketing
- Patient centrism
- Importance of emerging markets
- Change in target patients (e.g. elderly)

**REGULATION**
- Available funds = pressure on price
- Role of prevention
- Influence of regulation
- Global debate on patents

Source: Trends in pharma and prioritization (outlook 2020), Arthur D. Little analysis
The pharmaceutical industry must act against the increased speed and intensity of key drivers

1. **Changing business environment – Key drivers in evolution towards “pharma 2020”**

   **KEY DRIVERS IN EVOLUTION TOWARDS “PHARMA 2020”**

   **Economic / Market**
   - Growth in the global pharmaceutical market is expected to slow down to 3% a year
   - Pharmaceutical companies struggle to maintain both growth and profitability as margins decrease
   - Pharma growth is now driven by emerging countries, reorganizing geographic priorities for the industry
   - As blockbuster products come to an end, niche marketing becomes ever more important

   **Political / Regulation**
   - The global debate on patents fuels political pressures and incentives which pave the way for generics
   - Limitation of available funds leads to price pressure
   - Attention in healthcare is shifting towards prevention
   - New regulations limit access to and interaction with prescribers

   **Technological**
   - Innovation becomes more complex; despite continuing R&D spend, new drug approvals are lagging
   - A global wave of partnership formation is taking place
   - Rapid growth of biotech leads to increasing share and value of biologics
   - Increased technology integration

   **Social**
   - Prescriber access is more and more challenged as focus on patient centrism is growing
   - Key target patient groups are changing with demographic evolutions (e.g. aging population)
   - Higher pandemic risks lead to an increased importance of vaccines

Source: Trends in pharma and prioritization (outlook 2020), Arthur D. Little analysis

cfr. Detail slide
Growth in the global pharma market is expected to slow down to 3% a year (2008-2013)

- In 2008, the global pharmaceutical market was worth $730 bln.
- The US make up almost half of the global pharmaceutical market but its share is declining due to faster growth in the rest of the world.
- Due to healthcare cost containment measures in western countries, growth is likely to remain limited over the next years.

Source: IMS Health; SG Cowen – Therapeutic categories outlook (2009), Arthur D. Little analysis.
Pharmaceutical market growth is now driven by emerging countries, reorganizing geographic priorities for the industry


Source: IMS Health End of November 2008 & Arthur D. Little analysis
1) incl. hospitals; 2) top 5; 3) China, Brazil, India, South Korea, Mexico, Turkey & Russia
The global debate on patents fuels political pressures and incentives which pave the way for generics

Global pharmaceutical market split by generics and branded

<table>
<thead>
<tr>
<th>Year</th>
<th>Generics ($ bln)</th>
<th>Branded ($ bln)</th>
<th>Total ($ bln)</th>
<th>Share generics</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>551</td>
<td>120</td>
<td>671</td>
<td>18%</td>
</tr>
<tr>
<td>2008</td>
<td>567</td>
<td>134</td>
<td>701</td>
<td>19%</td>
</tr>
<tr>
<td>2009F</td>
<td>579</td>
<td>150</td>
<td>729</td>
<td>21%</td>
</tr>
<tr>
<td>2010F</td>
<td>580</td>
<td>170</td>
<td>750</td>
<td>23%</td>
</tr>
<tr>
<td>2011F</td>
<td>580</td>
<td>193</td>
<td>773</td>
<td>25%</td>
</tr>
<tr>
<td>2012F</td>
<td>574</td>
<td>221</td>
<td>795</td>
<td>28%</td>
</tr>
<tr>
<td>2013F</td>
<td>571</td>
<td>249</td>
<td>820</td>
<td>30%</td>
</tr>
</tbody>
</table>

Source: IMS Health; Datamonitor (2008); Arthur D. Little analysis

Comments

- The global generics market was worth approximately $120 billion in 2007, corresponding to 18% of the total market
- Generics is expected to grow with 13% annually, 2007-2013
- Main growth drivers:
  - healthcare cost containment, where generics have the advantage of low cost
  - blockbuster drugs approaching patent expiry
There is another reason for changing the current blockbuster model: individual response rate to existing medicines is not totally satisfactory today.

<table>
<thead>
<tr>
<th>Medicine Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension drugs (ACE inhibitors)</td>
<td>10-30%</td>
</tr>
<tr>
<td>Heart failure drugs (Betablockers)</td>
<td>15-25%</td>
</tr>
<tr>
<td>Anti-depressants (SSRIs)</td>
<td>20-50%</td>
</tr>
<tr>
<td>Cholesterol drugs (statins)</td>
<td>30-70%</td>
</tr>
<tr>
<td>Asthma drugs (beta-2-agonists)</td>
<td>40-70%</td>
</tr>
</tbody>
</table>

Percentage of the patient population for which any particular drug is ineffective.

Source: The case for personalized medicine, Personalized medicine coalition, November 2006 - Arthur D. Little analysis.
Patient sub-groups can optimize treatment response and side-effects management... and restore innovation premium: personalized medicine.

Differences in the genetic material between individuals... \(\Rightarrow\) ...leads to different pharmacokinetics and response rate between individuals

Source: Genomic Vision
Innovation becomes more complex; despite continuing R&D spend, new drug approvals are lagging

The spending on R&D has almost doubled over the last 8 years
- CAGR of 8.5% 2000-2008

Even though spending has increased over the last two decades, the number of original new drug approvals has been rather stable

A large number of late stage clinical compounds are generated from biotech ventures
- Indication that venture backed companies are efficient in R&D

Note: R&D spending figures for PhRMA (The Pharmaceutical Research and Manufacturers of America) which includes over 75% of total pharmaceutical R&D spend
As a direct consequence, product pipelines of the major players turned to specialized products targeted at complex diseases and hospital care while trying to achieve high prices.

Sources: Étude Eurostaf sur la visite médicale 2007, IMS Health, Arthur D. Little analysis
Prescriber access is more and more challenged as focus on patient centrisms is growing

**Historical situation**

- **PharmaCo**
- **Prescriber**
- **Payer**
- **Regulator**
- **Patient**

**Today**

- **PharmaCo**
  - Search for a novel business model “beyond the blockbusters”

- **Patient**
  - Better informed patients to offer better service and avoid malpractice

- **Prescriber**

- **Payer**
  - Increase focus on Health Economics

- **Regulator**
  - Involve patients more in risk/benefit assessments

Patients are increasingly well-informed, organized and powerful
After the success of the blockbusters, the pharmaceutical industry must refocus on 5 key steps to shape its future

1. **Back to the Core Science**
   - The industry needs to come back to its roots and focus on curing diseases with the help of science.

2. **Focus on Patients**
   - The industry can create high NPV by being increasingly patient-centric, leveraging the demographic changes and integrating into the vast information flow.

3. **Technology Integration**
   - Integration of technologies will enhance:
     - service level
     - ease of use
     - product delivery
     - supply chain efficiency
     - level of compliance
     - product development

4. **Global Markets**
   - Companies will have to rethink the location of their core activities as changing demographics force globalization.

5. **Partnerships**
   - Increased complexity in product development will create highly strategic virtual networks involving close collaboration of different but complementary players.

Source: Arthur D. Little analysis
The industry needs to come back to its roots and focus on curing diseases with the help of science.

**Key recommendations to shape the pharmaceutical industry’s future - Back to the core science**

- Uncertainty over the pipeline: *Blockbuster growth is insufficient*
- Trend towards personalized medicine: *Development of the niche-buster model*
- Increased speed of ‘fast follower’: *Closer innovation and second-generation*
- Reimbursement and cost pressure: *Shift towards long-term cost-benefit analyses*
- Growth of biochemistry: *Barrier against patent loss*

**Source:** Adapted from Simon & Kotler, ‘Building global biobrands’, Arthur D. Little analysis.
The industry can create high Net Present Value by being increasingly patient centric, leveraging the demographic changes and integrating into the vast information flow.

Key recommendations to shape the pharmaceutical industry’s future – Focus on patients

- Search for a novel business model “beyond the blockbusters”
- Increased focus on health economics
  - Delivering benefits
- Increased patient information transfer
  - Offer better service and avoid malpractice
- Change in key patient types
  - Stay close to respond faster
- Patient focused treatments and applications
  - Personalized medicine

Source: Arthur D. Little analysis

FOCUS ON PATIENTS

Historical situation

Future

Regulator  
PharmaCo  
Prescriber  
Payer  
Patient

Regulator  
PharmaCo  
Prescriber  
Payer  
Patient

Trends in the pharmaceutical industry
Integration of technologies will enhance the service level, the ease of use, the product delivery, the supply chain efficiency, the level of compliance and the product development.

From fully-integrated to virtually-integrated
Integration to deliver results

New emerging technologies
Providing new and more precise cures

Integration of systems
Using data to optimize cure

Rise of new manufacturing technologies
Increase manufacturing flexibility

Direct delivery to pharmacies
Bypass traditional wholesalers

Source: Arthur D. Little analysis
Companies will have to rethink the location of their core activities as changing demographics force globalization

- Steep rise of disposable incomes and the number of middle-class households
- Expansion of medical infrastructure
  *Market expansion*
- Greater penetration of health insurance
  *Market expansion*
- Shift in disease patterns
  *Rising prevalence of chronic diseases*
- Adoption of product patents
  *IP protection*

Source: Arthur D. Little analysis
Increased complexity in product development will create highly strategic virtual networks involving close collaboration of different but complementary players.

Key recommendations to shape the pharmaceutical industry’s future - Partnerships

- Lack of skills
  *Increase reliance on outsourcing*

- Need for increased production flexibility
  *Use of toll specialist manufacturers*

- Collaboration with close-to-patient personnel
  *Offer tailor-made solutions*

- Collaboration with IT driven integration
  *Virtual global organizations for direct delivery*

- Collaboration with governments and payers
  *Ease the development process*

Source: Arthur D. Little analysis

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Bayer and Tsinghua University establish joint research centre in China

Bayer Schering next five years along with the GSK and Pfizer’s HIV Joint Venture: Why It’s a Path Forward

Real innovation in dealmaking, like

Merck et AstraZeneca s’associent contre le cancer

Les groupes pharmaceutiques américain Merck et britannique AstraZeneca vont collaborer pour élaborer un nouveau traitement contre le cancer associant deux de les ils annonc

Jubilant Organosys and Lilly to Form Drug Development Joint Venture

Posted October 7, 2008

Jubilant Organosys and Lilly to Form Drug Development Joint Venture
The future of pharma holds significant challenges, which can all be converted into new opportunities for the industry.

1. Focus on a strong medical science basis

2. Put the patient at the centre of product development and its full life cycle

3. Integrate technologies to supply better treatments faster

4. Be ready to use the new global market and global resources

5. Create strategic partnerships to accelerate success

Source: Arthur D. Little analysis
Today, expansion strategies in pharma are mostly driven by traditional ways of thinking leading to three business models: global players, low cost manufacturers and niche players.

**Typical expansion strategies in the pharmaceutical business**

- **Orphan (targeted)**
- **Rare/Complex (specialty / hospital only)**
- **Frequent (mass market)**
- **Endemic (Public Health)**

**Biopharmaceutical & niche players**

**Generic and Commodity market**

**Global Leaders**

- **Domain market** (50 to 300 millions people)
- **Developed countries** (~ 1 bn people)
- **Solvable population** (~ 2 bn people)
- **Worldwide population** (~ 6 bn people)

**Ability to commercialize**

Source: Arthur D. Little, Life Sciences Practice Institute
Moreover, most of the leading players now consider 'health' as more than traditional prescription medicines based on small molecules.

<table>
<thead>
<tr>
<th></th>
<th>Traditional Rx small molecules</th>
<th>Biologics</th>
<th>Vaccines</th>
<th>OTC/OTX(1)</th>
<th>Generics</th>
<th>Animal Health</th>
<th>Medical Devices &amp; IVD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sanofi Aventis</strong></td>
<td>★★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★</td>
<td>★</td>
<td>★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td><strong>Johnson &amp; Johnson</strong></td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td><strong>Pfizer/Wyeth</strong></td>
<td>★★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td><strong>GSK</strong></td>
<td>★★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td><strong>Novartis</strong></td>
<td>★★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td><strong>Roche</strong></td>
<td>★★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td><strong>AstraZeneca</strong></td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★★</td>
</tr>
<tr>
<td><strong>Merck/Schering-Plough</strong></td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★</td>
<td>★★★★★</td>
</tr>
</tbody>
</table>

Sources: Based on sanofi-aventis, General Assembly, April 11th 2009, Arthur D. Little

1) OTX: combination of over-the-counter (OTC) and prescription (Rx), corresponds mainly to prescription-free medicines sold in pharmacies and relying on clinical trials

2) Pro forma
Five “Step Change” business model archetypes can be tailored and combined to best address the changing business environment and to implement the five identified

<table>
<thead>
<tr>
<th>Archetype</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Share the cake differently</td>
<td>Engage with external parties (customers or partners) in a novel way, thus enabling a complete overhaul of the traditional cost structure &amp; pricing format used by your industry</td>
</tr>
<tr>
<td>2. Supplant the middleman</td>
<td>Go direct to your customers, thereby establishing a more intimate relationship with your customer community, and use the changed cost structure to widen your product portfolio and/or offer lower prices</td>
</tr>
<tr>
<td>3. Shift cost curve structurally</td>
<td>Deploy a radically different asset base to achieve – for existing products – cost levels previously considered unattainable and consequently price levels initially labeled suicidal by competitors</td>
</tr>
<tr>
<td>4. Redefine customer experience</td>
<td>Exploit unique operational capabilities and systems to offer customers a purchase experience they probably could never have imagined themselves</td>
</tr>
<tr>
<td>5. Convert products into service</td>
<td>Keep ownership of the product and charge customers for its per-unit-use as if it were a utility, thereby lowering the purchase barrier</td>
</tr>
</tbody>
</table>

Source: “Bringing business models down to earth” (Arthur D. Little, 2008)
We believe that a combination of the first three “step change” business models is best suited to guide the ambition of an ideal competitor in the “Greatest challenge of change” scenario.

Priority “Step Change” business model archetypes

1. Share the cake differently
   - IKEA
   - JCDecaux
   - biovitrum.

2. Supplant the middleman
   - amazon.com
   - ING DIRECT
   - Pfizer

3. Shift cost curve structurally
   - RYANAIR.com
   - Skype
   - Sandoz
   - Nucor

4. Redefine customer experience
   - McDonald's
   - Inditex
   - Gambro
   - Baxter

5. Convert product into service
   - xerox
   - Cintas
   - Salesforce.com
   - Fresenius
We anticipate four general scenarios for the pharma industry 2020

- Scenario 1: "Greatest challenge for change"
  - High degree of change
  - Science / Technology
  - Markets / Regulation
  - End of blockbusters
  - Patient centricity
  - Increasing importance of emerging markets
  - Change in target patients
  - Increased Integration
  - Increased IT/IS
  - Growth of biotech
  - Innovation
  - Funds available
  - Prevention
  - Regulation

- Scenario 2: "niche markets"
  - High degree of change
  - Markets / Regulation
  - End of blockbusters
  - Patient centricity
  - Increasing importance of emerging markets
  - Change in target patients
  - Increased Integration
  - Increased IT/IS
  - Growth of biotech
  - Innovation
  - Funds available
  - Prevention
  - Regulation

- Scenario 3: "Fast pacing technology"
  - High degree of change
  - Science / Technology
  - Markets / Regulation
  - End of blockbusters
  - Patient centricity
  - Increasing importance of emerging markets
  - Change in target patients
  - Increased Integration
  - Increased IT/IS
  - Growth of biotech
  - Innovation
  - Funds available
  - Prevention
  - Regulation

- Scenario 4: "Continuous improvement"
  - Low degree of change
  - Science / Technology
  - Markets / Regulation
  - End of blockbusters
  - Patient centricity
  - Increasing importance of emerging markets
  - Change in target patients
  - Increased Integration
  - Increased IT/IS
  - Growth of biotech
  - Innovation
  - Funds available
  - Prevention
  - Regulation

Illustrative: Business models to answer the change – Scenario analysis to determine the best business model.
The pharmaceutical industry will continue to strive to success, focusing on patients throughout an open-minded system

Source: Arthur D. Little analysis