2018 Survey Results

SPEE 2018 Petroleum Evaluation Software Symposium

For questions, please contact Dilhan Ilk – dilk@demac.com
Presentation Outline

• Demographics
• Software Choice
• Software General
• Software Usage
• Software Specifics
• Software Improvements
• Conclusions
Demographics
What type of company do you work for?

- **E&P**: 150
- **Consultant**: 124
- **Private Equity**: 19
- **Academia**: 10
- **Other**: 3
- **Service**: 2
- **Software**: 2
- **Total**: 312
Which of these roles best describe your job responsibilities?

<table>
<thead>
<tr>
<th>Role</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineer</td>
<td>176</td>
</tr>
<tr>
<td>Manager</td>
<td>47</td>
</tr>
<tr>
<td>Executive</td>
<td>43</td>
</tr>
<tr>
<td>Technician</td>
<td>28</td>
</tr>
<tr>
<td>Geoscientist</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
</tr>
<tr>
<td>Economist</td>
<td>3</td>
</tr>
<tr>
<td>Financial Analyst</td>
<td>2</td>
</tr>
<tr>
<td>Academic</td>
<td>2</td>
</tr>
</tbody>
</table>
Survey Responses

Where are most of the projects that you work located?

- United States: 71%
- International: 13%
- Canada: 16%

48 percent single software user
52 percent multi-software user
(out of 311 responses)
Survey Responses (North America)
Software Choice
Which economic/reserves management software do you regularly use?

- **PHDWin**: 36%
- **Aries**: 22%
- **Mosaic**: 10%
- **ValNav**: 9%
- **In-house**: 7%
- **Other**: 5%
- **Peep**: 5%
- **OGRE**: 3%
- **Enersight**: 2%
- **Palantir**: 1%
Which technical analysis software do you regularly use?

- PHDWin: 18.7%
- IHS/Fekete: 12.1%
- DrillingInfo: 11.5%
- Aries: 11.2%
- Spotfire: 10.4%
- In-house: 6.7%
- ValNav: 5.0%
- Mosaic: 5.0%
- Other: 3.7%
- Kappa/Citrine: 3.4%
- Power Tools: 2.9%
- CMG/Eclipse/Nexus: 2.7%
- MBAL: 2.4%
- Enersight: 1.4%
- OGRE: 1.0%
- Ruths.ai: 0.7%
- Interfaces - Sahara: 0.6%
- Q Engineering: 0.2%
- C&C Reservoirs: 0.2%
- IHS/Fekete:
  - Private Equity: 4%
  - Service: 1%
  - Bank: 4%
  - Consultant: 29%
  - E&P: 62%
- DrillingInfo:
  - Private Equity: 5%
  - Academia: 2%
  - Bank: 11%
  - Consultant: 39%
  - E&P: 43%
- Spotfire:
  - Private Equity: 4%
  - Academia: 1%
  - Bank: 3%
  - Consultant: 29%
  - E&P: 63%
Software General
How long have you been using economic software?

- More than 10 years: 74%
- Less than 10 years: 13%
- Less than 5 years: 10%
- Less than 2 years: 3%

How do you consider yourself for your software?

**Economic Software**
- Expert: 40%
- Proficient: 52%
- Novice: 8%

**Technical Software**
- Expert: 28%
- Proficient: 57%
- Novice: 15%
How satisfied are you with your software?

Economic/Technical Analysis/Reserves Management

<table>
<thead>
<tr>
<th>Satisfaction Level</th>
<th>Economic</th>
<th>Technical Analysis</th>
<th>Reserves Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very satisfied</td>
<td>45.5%</td>
<td>34.6%</td>
<td>38.5%</td>
</tr>
<tr>
<td>Somewhat satisfied</td>
<td>36.5%</td>
<td>25.3%</td>
<td>36.5%</td>
</tr>
<tr>
<td>Neutral</td>
<td>11.9%</td>
<td>10.9%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Somewhat dissatisfied</td>
<td>5.1%</td>
<td>4.5%</td>
<td>6.4%</td>
</tr>
<tr>
<td>Very dissatisfied</td>
<td>0.6%</td>
<td>0.6%</td>
<td>1.3%</td>
</tr>
</tbody>
</table>
Software Usage
Where do you generate technical forecasts?

- Manually input in economics software: 50%
- Automatically generated in economics software by auto-forecasting or regression: 31%
- Imported from another program: 19%
What methods for production forecasting do you generally use?

- Arps with terminal decline: 48%
- Analogy/type curves: 20%
- Other historical performance plots: 7%
- Other decline-curve relations: 7%
- Reservoir simulation: 5%
- Rate-transient analysis: 5%
- Material balance: 5%
- Fractional flow: 3%
For what purpose do you use technical analysis/numerical software?

- Reserves estimates: 36%
- Production projections: 28%
- Preparation of type-well profiles: 16%
- Completion evaluation: 7%
- Recovery factors: 7%
- Flow regime analysis: 6%
Where do you generally prepare type-well profiles?

Using economic software: 42%
Using Microsoft Excel-based spreadsheets: 25%
Using technical analysis/numeric al software: 24%
In-house: 6%
Other: 3%
Software Specifics
Do the results from your technical software are exported easily to your economics software?

Yes: 68%
No: 32%

- Keyboard strokes to copy/paste: 24%
- Direct link of data sources: 37%
- Menu function in each application to store or import external files: 39%
Is your economic software sufficiently capable of outputting and illustrating computed results?

- My software is flexible enough for my needs: 41%
- I use additional software for visualizing/tabulating results: 59%
How long does it take you to forecast?

Forecast and run (with economics) approximately 1,000 new PDP wells

- 1 day: 9%
- 1 week: 45%
- 2 weeks: 32%
- 1 month: 12%
- My career: 2%

Update forecasts and run (with economics) approximately 1,000 PDP wells

- 1 day: 27%
- 1 week: 52%
- 2 weeks: 15%
- 1 month: 5%
- My career: 2%
How long does it take you to forecast?

Forecast and run (with economics) approximately 1,000 new PUD wells

- 1 day: 19%
- 1 week: 37%
- 2 weeks: 28%
- 1 month: 14%
- My career: 2%

Update forecasts and run (with economics) approximately 1,000 PUD wells

- 1 day: 37%
- 1 week: 38%
- 2 weeks: 15%
- 1 month: 7%
- My career: 2%
How long does it take you to forecast?

**PHDWin**

<table>
<thead>
<tr>
<th>Forecast and run (with economics) approximately 1,000 new PDP wells</th>
<th>Update forecasts and run (with economics) approximately 1,000 PDP wells</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 day</td>
<td>1 day</td>
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<tr>
<td>8%</td>
<td>26%</td>
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<td>1 week</td>
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<td>47%</td>
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<td>2 weeks</td>
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<tr>
<td>32%</td>
<td>15%</td>
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<td>1 month</td>
<td>1 month</td>
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<tr>
<td>12%</td>
<td>3%</td>
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<tr>
<td>My career</td>
<td>My career</td>
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<tr>
<td>1%</td>
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</tbody>
</table>
How long does it take you to forecast?

PHDWin

Forecast and run (with economics) approximately 1,000 new PUD wells

- 1 day: 18%
- 1 week: 41%
- 2 weeks: 24%
- 1 month: 15%
- My career: 2%

Update forecasts and run (with economics) approximately 1,000 PUD wells

- 1 day: 37%
- 1 week: 40%
- 2 weeks: 16%
- 1 month: 6%
- My career: 1%
How long does it take you to forecast?
Aries

Forecast and run (with economics) approximately 1,000 new PDP wells

- 1 day: 9%
- 1 week: 50%
- 2 weeks: 32%
- 1 month: 9%
- My career: 0%

Update forecasts and run (with economics) approximately 1,000 PDP wells

- 1 day: 23%
- 1 week: 62%
- 2 weeks: 13%
- 1 month: 3%
- My career: 0%
How long does it take you to forecast?

Aries

Forecast and run (with economics) approximately 1,000 new PUD wells

- 1 day: 23%
- 1 week: 35%
- 2 weeks: 29%
- 1 month: 13%
- My career: 1%

Update forecasts and run (with economics) approximately 1,000 PUD wells

- 1 day: 39%
- 1 week: 41%
- 2 weeks: 14%
- 1 month: 6%
- My career: 0%
How long does it take you to forecast? Mosaic

Forecast and run (with economics) approximately 1,000 new PDP wells

- 1 day: 6%
- 1 week: 48%
- 2 weeks: 31%
- 1 month: 8%
- My career: 6%

Update forecasts and run (with economics) approximately 1,000 PDP wells

- 1 day: 27%
- 1 week: 47%
- 2 weeks: 16%
- 1 month: 4%
- My career: 6%
How long does it take you to forecast?

Mosaic

Forecast and run (with economics) approximately 1,000 new PUD wells

- 1 day: 13%
- 1 week: 40%
- 2 weeks: 29%
- 1 month: 15%
- My career: 4%

Update forecasts and run (with economics) approximately 1,000 PUD wells

- 1 day: 30%
- 1 week: 43%
- 2 weeks: 15%
- 1 month: 9%
- My career: 4%
How long does it take you to forecast?

ValNav

Forecast and run (with economics) approximately 1,000 new PDP wells

<table>
<thead>
<tr>
<th>Time</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>1 day</td>
<td>16%</td>
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<tr>
<td>1 week</td>
<td>36%</td>
</tr>
<tr>
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<td>36%</td>
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<tr>
<td>1 month</td>
<td>13%</td>
</tr>
<tr>
<td>My career</td>
<td>0%</td>
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</tbody>
</table>

Update forecasts and run (with economics) approximately 1,000 PDP wells

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<thead>
<tr>
<th>Time</th>
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</thead>
<tbody>
<tr>
<td>1 day</td>
<td>30%</td>
</tr>
<tr>
<td>1 week</td>
<td>51%</td>
</tr>
<tr>
<td>2 weeks</td>
<td>11%</td>
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<tr>
<td>1 month</td>
<td>9%</td>
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<tr>
<td>My career</td>
<td>0%</td>
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Forecast and run (with economics) approximately 1,000 new PDP wells

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<td>My career</td>
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Update forecasts and run (with economics) approximately 1,000 PDP wells

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<td>9%</td>
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<tr>
<td>My career</td>
<td>0%</td>
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How long does it take you to forecast?
ValNav

Forecast and run (with economics) approximately 1,000 new PUD wells

- 1 day: 20%
- 1 week: 24%
- 2 weeks: 41%
- 1 month: 15%
- My career: 0%

Update forecasts and run (with economics) approximately 1,000 PUD wells

- 1 day: 33%
- 1 week: 41%
- 2 weeks: 15%
- 1 month: 11%
- My career: 0%
How difficult is your software to learn?

Economic Software Learning Curve

- Difficult: 12%
- Easy: 18%
- Moderate: 68%
- Very difficult: 2%

Technical Analysis Software Learning Curve

- Difficult: 17%
- Easy: 9%
- Moderate: 72%
- Very difficult: 2%
How satisfied are you with your economic software? – PHDWin

- Very satisfied: 50%
- Somewhat satisfied: 37%
- Neutral: 10%
- Somewhat dissatisfied: 3%
- Very dissatisfied: 0%
How satisfied are you with your economic software? – Aries

Very satisfied: 39%
Somewhat satisfied: 43%
Neutral: 11%
Somewhat dissatisfied: 6%
Very dissatisfied: 1%
How satisfied are you with your economic software? – Mosaic

- Very satisfied: 36%
- Somewhat satisfied: 46%
- Neutral: 12%
- Somewhat dissatisfied: 6%
How satisfied are you with your economic software? – ValNav

- Very satisfied: 33%
- Somewhat satisfied: 44%
- Neutral: 13%
- Somewhat dissatisfied: 8%
- Very dissatisfied: 2%
How do you arrive at recovery factors from immature fields?

- Analogy to other mature fields: 42%
- Type curves: 33%
- Material balance: 13%
- Reservoir simulation: 12%
Software Improvements
What are the features you most urgently need from your economic software?

<table>
<thead>
<tr>
<th>Feature</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve visual aspects (user interface, better plots, etc.)</td>
<td>15.1%</td>
</tr>
<tr>
<td>Report output, including formal report tables and visualizations</td>
<td>14.0%</td>
</tr>
<tr>
<td>for presentation purposes</td>
<td></td>
</tr>
<tr>
<td>Improve technical content (more decline-curve relations, type-well</td>
<td>12.8%</td>
</tr>
<tr>
<td>profile improvements)</td>
<td></td>
</tr>
<tr>
<td>Improve speed</td>
<td>10.0%</td>
</tr>
<tr>
<td>Improve comparison capabilities (year-over-year, scenarios, etc.)</td>
<td>9.4%</td>
</tr>
<tr>
<td>Reliability of auto forecasts</td>
<td>8.6%</td>
</tr>
<tr>
<td>Improve/add economic models for different fiscal regimes</td>
<td>8.0%</td>
</tr>
<tr>
<td>Improve database capabilities as centralized repository</td>
<td>7.9%</td>
</tr>
<tr>
<td>Capability of auto forecasts</td>
<td>6.9%</td>
</tr>
<tr>
<td>Improve reserves/resources/business planning classification and</td>
<td>5.6%</td>
</tr>
<tr>
<td>categorization</td>
<td></td>
</tr>
<tr>
<td>No improvements necessary</td>
<td>1.7%</td>
</tr>
</tbody>
</table>
Technical improvements that your economic software needs

<table>
<thead>
<tr>
<th>Improvement</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add diagnostic plots, normalizations, flexible visualizations</td>
<td>27%</td>
</tr>
<tr>
<td>Add modules for type-well profile construction</td>
<td>22%</td>
</tr>
<tr>
<td>Provide connection to technical analysis/numerical software and ability to import projections</td>
<td>19%</td>
</tr>
<tr>
<td>Add more decline-curve models (e.g., stretched exponential, power-law, transient hyperbolic, Duong, etc.)</td>
<td>17%</td>
</tr>
<tr>
<td>Add modules for classification and categorization</td>
<td>8%</td>
</tr>
<tr>
<td>No improvements necessary</td>
<td>7%</td>
</tr>
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</table>
**Urgent needs — PHDWin**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Improvement Needed (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve visual aspects (user interface, better plots, etc.)</td>
<td>14.2%</td>
</tr>
<tr>
<td>Improve technical content (more decline-curve relations, type-well profile improvements)</td>
<td>13.7%</td>
</tr>
<tr>
<td>Report output, including formal report tables and visualizations for presentation purposes</td>
<td>12.7%</td>
</tr>
<tr>
<td>Improve speed</td>
<td>11.3%</td>
</tr>
<tr>
<td>Improve comparison capabilities (year-over-year, scenarios, etc.)</td>
<td>9.8%</td>
</tr>
<tr>
<td>Improve database capabilities as centralized repository</td>
<td>8.8%</td>
</tr>
<tr>
<td>Reliability of auto forecasts</td>
<td>8.1%</td>
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<tr>
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<tr>
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</tr>
<tr>
<td>Improve reserves/resources/business planning classification and categorization</td>
<td>5.4%</td>
</tr>
<tr>
<td>No improvements necessary</td>
<td>1.5%</td>
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</tbody>
</table>
## Technical improvements — PHDWin

<table>
<thead>
<tr>
<th>Suggestion</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add diagnostic plots, normalizations, flexible visualizations</td>
<td>26.4%</td>
</tr>
<tr>
<td>Add modules for type-well profile construction</td>
<td>21.7%</td>
</tr>
<tr>
<td>Provide connection to technical analysis/numerical software and ability to import projections</td>
<td>19.3%</td>
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<tr>
<td>Add more decline-curve models (e.g., stretched exponential, power-law, transient hyperbolic, Duong, etc.)</td>
<td>17.3%</td>
</tr>
<tr>
<td>Add modules for classification and categorization</td>
<td>9.1%</td>
</tr>
<tr>
<td>No improvements necessary</td>
<td>6.3%</td>
</tr>
</tbody>
</table>
### Urgent needs — Aries

<table>
<thead>
<tr>
<th>Feature</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve visual aspects (user interface, better plots, etc.)</td>
<td>18.1%</td>
</tr>
<tr>
<td>Improve technical content (more decline-curve relations, type-well profile improvements)</td>
<td>13.3%</td>
</tr>
<tr>
<td>Report output, including formal report tables and visualizations for presentation purposes</td>
<td>11.1%</td>
</tr>
<tr>
<td>Reliability of auto forecasts</td>
<td>10.7%</td>
</tr>
<tr>
<td>Improve comparison capabilities (year-over-year, scenarios, etc.)</td>
<td>10.4%</td>
</tr>
<tr>
<td>Improve speed</td>
<td>9.6%</td>
</tr>
<tr>
<td>Improve database capabilities as centralized repository</td>
<td>8.1%</td>
</tr>
<tr>
<td>Improve/add economic models for different fiscal regimes</td>
<td>7.0%</td>
</tr>
<tr>
<td>Capability of auto forecasts</td>
<td>6.3%</td>
</tr>
<tr>
<td>Improve reserves/resources/business planning classification and categorization</td>
<td>4.4%</td>
</tr>
<tr>
<td>No improvements necessary</td>
<td>0.7%</td>
</tr>
</tbody>
</table>
### Technical improvements — Aries

<table>
<thead>
<tr>
<th>Suggestion</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Add diagnostic plots, normalizations, flexible visualizations</td>
<td>27.5%</td>
</tr>
<tr>
<td>Add modules for type-well profile construction</td>
<td>23.6%</td>
</tr>
<tr>
<td>Provide connection to technical analysis/numerical software and ability to import projections</td>
<td>20.8%</td>
</tr>
<tr>
<td>Add more decline-curve models (e.g., stretched exponential, power-law, transient hyperbolic, Duong, etc.)</td>
<td>16.9%</td>
</tr>
<tr>
<td>Add modules for classification and categorization</td>
<td>7.9%</td>
</tr>
<tr>
<td>No improvements necessary</td>
<td>3.4%</td>
</tr>
</tbody>
</table>
Urgent needs — Mosaic

- Report output, including formal report tables and visualizations for presentation purposes: 19.3%
- Improve visual aspects (user interface, better plots, etc.): 14.3%
- Reliability of auto forecasts: 10.1%
- Capability of auto forecasts: 10.1%
- Improve comparison capabilities (year-over-year, scenarios, etc.): 9.2%
- Improve speed: 9.2%
- Improve/add economic models for different fiscal regimes: 8.4%
- Improve technical content (more decline-curve relations, type-well profile improvements): 7.6%
- Improve database capabilities as centralized repository: 5.9%
- Improve reserves/resources/business planning classification and categorization: 4.2%
- No improvements necessary: 1.7%
Technical improvements — Mosaic

- Add diagnostic plots, normalizations, flexible visualizations: 32.5%
- Add modules for type-well profile construction: 20.0%
- Add more decline-curve models (e.g., stretched exponential, power-law, transient hyperbolic, Duong, etc.): 17.5%
- Provide connection to technical analysis/numerical software and ability to import projections: 12.5%
- No improvements necessary: 12.5%
- Add modules for classification and categorization: 5.0%
<table>
<thead>
<tr>
<th>Urgent needs — ValNav</th>
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</thead>
<tbody>
<tr>
<td>Report output, including formal report tables and visualizations for presentation purposes</td>
</tr>
<tr>
<td>Improve visual aspects (user interface, better plots, etc.)</td>
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<tr>
<td>Improve/add economic models for different fiscal regimes</td>
</tr>
<tr>
<td>Improve technical content (more decline-curve relations, type-well profile improvements)</td>
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<tr>
<td>Improve comparison capabilities (year-over-year, scenarios, etc.)</td>
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<tr>
<td>Improve speed</td>
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<td>Improve database capabilities as centralized repository</td>
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<tr>
<td>Reliability of auto forecasts</td>
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<tr>
<td>Improve reserves/resources/business planning classification and categorization</td>
</tr>
<tr>
<td>Capability of auto forecasts</td>
</tr>
<tr>
<td>No improvements necessary</td>
</tr>
</tbody>
</table>
Technical improvements — ValNav

- Add diagnostic plots, normalizations, flexible visualizations: 28.8%
- Provide connection to technical analysis/numerical software and ability to import projections: 20.3%
- Add modules for type-well profile construction: 16.9%
- Add more decline-curve models (e.g., stretched exponential, power-law, transient hyperbolic, Duong, etc.): 15.3%
- No improvements necessary: 10.2%
- Add modules for classification and categorization: 8.5%
Conclusions

• Generally survey participants expressed their satisfaction with their economic software.

• Arps’ decline is the widely used methodology for production forecasts.

• Participants expressed interest in improved type well profiles modules in economic software.

• Economic software requires improvements for report output, improvements in visualizing/tabulating results and technical content.

• Most urgent technical improvement in economic software appears to be diagnostic plots, normalizations, and flexible visualizations.
2018 Survey Results

SPEE 2018 Petroleum Evaluation Software Symposium

For questions, please contact Dilhan Ilk – dilk@demac.com