Transforming the working world with knowledge tech

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Katrina Pugh and Greg Nemeth
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Katrina Pugh
Senior Manager — Advisory, Modern Workplace, Digital Data & Analytics
Ernst & Young LLP
Boston, Massachusetts

Greg Nemeth
Director — Global Knowledge Platforms
Ernst & Young LLP
Cleveland, Ohio
Reading and interpreting content is costing businesses ... and countries

4.3%* $43m* $36m*

of GDP lost as users search for content in lost productivity for typical $1b company in productivity lost in recreating content

What if we could spend 80% less time finding and reading documents?

What does it mean to “read” a document?

Are these letters, words or meaningful images?

What language is this?

What is this? What type of document? (Is it a contract? Email? Letter? Article?)

Is there personally identifiable information (PII), critical language?

Is the process “working”? Can we improve it?

Optical character recognition (OCR), voice/image recognition

Language translators

Unitization, document review, coding

Data mining, indexing

Pattern recognition and machine learning, robotic logic, text replacement, legal remedies, legal hold, data loss prevention
Leveraging knowledge technologies for the enterprise

a. Content optimization at scale
b. The search conundrum
About EY

Organization of member firms operating in 150 countries
► Assurance, tax, transaction and advisory services
► Wide, diverse business units and offerings
► Constantly growing and evolving
► Approximately 250,000 employees

Knowledge is a key differentiator with EY’s Vision 2020 strategy.
Transforming the working world with knowledge tech

Content optimization at scale

**Findable** — Deliver a search experience that makes identifying relevant content easy.

**Intake** — Prioritize content needs — harvest and publish relevant content.

**Optimize and publish content**

**Usable** — Comply with confidentiality and intellectual property rights while engineering for reuse.

**Archive** — Archive obsolete content to maintain the quality and relevance of the content collection.

**Valuable** — Accept and curate only relevant, high-value content that is connected to related materials and people.
Robotic process automation (RPA) for redaction

- Client and sector details
- Subsidiary and entity
- Location and acronyms
- Person names
- Addresses
- Fees and hours
- Embedded files
- Numbers and URLs
- Case studies and credentials
- Bios and CVs
- Logos and images
- Apply branding

150 minutes
RPA for redaction

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60 minutes
Business impact of the redaction bot

1.88
Full-time equivalent (FTE) savings

89%
Bot accuracy

90 minutes
Sanitization cycle time savings

14 days
2 days
Submission-to-publish cycle time reduced

60%
Efficiency gain
The search conundrum

**Challenges**

- Delta between what users want and what they type
- Expectations derived from commercial experiences
- Limitations of the search interface

- Machine learning (ML)-powered type-ahead
- ML-powered facets
- Speech to text/natural language understanding (NLU)

**Opportunities**

- Data-driven personalized/contextualized search
- ML-powered entity recognition

**Query submission**

- Delta between what users want and what they type
- Expectations derived from commercial experiences
- Limitations of the search interface

**Query processing**

- Delta between what users want and what search returns
- Lack of sophistication and understanding of nuance
- The user and search speaking different languages

- Machine learning (ML)-powered type-ahead
- ML-powered facets
- Speech to text/natural language understanding (NLU)

**Query refinement**

- Disconnect on the sequence
- Gap between desired and available filters
- Frequent need to “start over”

- Natural language processing (NLP)-driven filters
- Contextualized search options and understanding
Our approach

► Focused on common use cases and tested with live data

► Defined core objectives for the pilot:
   1. Evaluation of Bing Speech and Language Understanding (LUIS) services
   2. User satisfaction
   3. Level of effort to scale to the rest of EY

► Collected feedback from our people:
   Piloted with ~1,200 practitioners; feedback on over 1,300 searches

Leveraged Microsoft Cognitive Services:

► Bing Speech API
► LUIS
### Artificial intelligence (AI) pilot: results

<table>
<thead>
<tr>
<th>Bing Speech/LUIS</th>
<th>User satisfaction</th>
<th>Level of effort</th>
</tr>
</thead>
<tbody>
<tr>
<td>Users responded positively to LUIS</td>
<td>Pilot users were generally positive regarding the LUIS functionality</td>
<td>Functionality expansion to all verticals</td>
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<tr>
<td>Flexibility in LUIS configuration</td>
<td>Users were intrigued by voice searching, but not always satisfied with results</td>
<td>Ability to perform keyword searches and advanced searches</td>
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<tr>
<td>Bing Speech shows promise, but more tuning required</td>
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<td>Overlaps in taxonomy</td>
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<td>Privacy concerns will need to be addressed</td>
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</table>
Leveraging knowledge technologies for clients

(Document intelligence)
Why did EY pursue document intelligence for clients?

- EY reads more business documents than anyone.
- EY has access to massive amounts of robot training data.
- Deep learning makes possible humanlike reading and interpretation of documents.
- EY has deep experience in interpreting and analyzing business documents and making decisions.
- Most client organizations have large document usage “patterns.”
- EY technology combined with alliance partners (e.g., Microsoft) enables robust deployment.
Document intelligence: reading and interpreting

**Reading**
- Text documents
- Structured documents
- Spreadsheets

**Interpreting**
- Natural language generation (NLG)
- Dashboards and spreadsheets
- Q/A

**Knowledge base**

Dialogue or chat
### Asset, supply chain and inventory management are the hottest AI areas in manufacturing

#### Technology value chain impact

<table>
<thead>
<tr>
<th>Internet of things (IoT) and AI examples</th>
<th>Manufacturing</th>
<th>High-technology and industrial</th>
<th>Transportation</th>
<th>Logistics</th>
<th>Retail and wholesale</th>
<th>Utilities</th>
<th>Telecom</th>
<th>Media and entertainment</th>
<th>Health care</th>
<th>Consumer products</th>
<th>Pharma</th>
<th>Chemical, oil and gas</th>
<th>Financial services and insurance</th>
<th>Government and public sector</th>
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<td>Smart products</td>
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*Source: Forrester, Inc.*

![Cool, Warm, Hot, Hotter, Hottest](chart)
Performing quality control

“I want to evaluate the samples against quality control criteria, analyze the quality results and fix without performing hours of review of the acceptance criteria and latest quality standards.” — Technician
### Media and entertainment client improved product testing productivity

#### Client challenges
- Need for vastly increased throughput from quality and safety team
- Engineers difficult to hire and train
- Limited consistency; need to deal with arbitrary inputs
- Highly cyclical demand creates staffing challenges

#### Approach
- Cognitive automation: read, understand and act by learning from humans
- Cortana
- ML engineers
- Intelligent automation design, build

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**Microsoft**
Cognitive robot accuracy

Input

- Emails: 1,161 emails
  - Lab report?
    - Yes: Download attachments: 502 reports
    - No: Archive email: 659 emails

Rule-driven

- Read content
- Master list of tests
- Missing test?
  - No: Global pass?
    - Yes: The product is cleared for shipping: 375 reports
    - No: Pass with exception
- Regulatory
- Non-regulatory
- Cognitive model: 127 reports

Semi-cognitive

- Send email with reason
- 92% accuracy
Outcomes

92% Accuracy (correct routing)

10 workforce reduced

5 seconds

30 seconds Time to review down to

Similar technique now in finance function for contracts

Of the 127 reports, 80% were used to train the bot and 20% to test the bot. In the two failure instances, the bot could not make a classification because it had not seen the report formats before.
The cognitive robot is powered by a series of advanced capabilities provided in the **Cortana Intelligence Suite**.
Key learnings

► Embrace innovation as a non-linear process
► Know the user, know the domain
► Rapid development of AI affords fast course corrections and even faster breakthroughs
► Reducing errors and repetitive work frees time for innovation
About EY
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