The Business Case for a Knowledge Engineer

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Abstract

The Inventory Management department should be expanded to include a position for knowledge creation and analytical development. This position would allow for increased strategic positioning, business growth, and informed decision making. In addition, it would provide much-needed support to the various business functions in need of analytical services.

The position would include the responsibility to hand off deliverables to I.T. for implementation, simultaneous development of multiple projects, and responding to ad hoc queries about various business metrics. As a result, the position requires a broad mix of skills including but not limited to computational and mathematical skills, software engineering, local business knowledge, the ability to cross departmental boundaries, and the willingness to leverage the expertise of AMS and GE at large.

1 The Case

1.1 From Data to Knowledge

Our company culture has always included a deep respect for data. However, as many have noticed, we are often data-rich but knowledge poor. The excellent effort at every level in every function to record and maintain the transactional data generated on a daily basis often exhausts our resources. As a result, very little time and effort is regularly expended to generate knowledge from this wealth of data.

Our deep expertise in our industry, a detail-oriented IT infrastructure, and well-developed knowledge tool skills (such as Excel use) only exacerbate the problem. Questions are often asked, answered, and discarded before the knowledge generated can be captured. In addition, those who lack access to the appropriate data and skills are often at a loss to access this wealth of knowledge.

In addition, there are tremendous opportunities for new analytical projects to leverage our data assets. These projects could:

- Drive efficiency by optimizing various business variables like pricing, product mix, and expected inventory impairment.

- Allow limited, but cost-free business experimentation. Analytical models are difficult to build and verify, but allow reasonable answers to ad hoc questions from business leaders without changing current policies and procedures.

- Provide the knowledge necessary for strategic sales. Analytical tools can be developed to help salespeople target new customers and drive growth with existing customers. Non-obvious strategies might be uncovered, such as targeting specific equipment types in certain markets.

1.2 From Ad hoc to IT

Many knowledge-based and analytical projects begin as a single ad hoc query or one-off question. Often a decision maker simply wants to know how a particular metric is changing over time or affecting other

variables and processes. These ad hoc requests are important in and of themselves; unfortunately today they are often ignored or consume a disproportionate share of knowledge worker time.

As a result, one goal for anyone dealing with knowledge creation or analytical modeling must somehow gather and curate the data, tools, and processes necessary for ad hoc queries. In addition, these queries can frequently yield new metrics, new models, and new procedures for regularly answering the given question. Eventually the new artifacts generated by the knowledge worker may become business critical or part of standard business functions.

At this point, the work product should be handed off to Information Technology for "proper" system integration. A knowledge worker in Inventory Management performing these roles and liaising with I.T. is an effective and efficient choice because:

- The specificity of the job results in sharpened skills and domain knowledge necessary to understand and execute complicated ad hoc knowledge requests.

- Ownership of both the question and the answer provide a single touch point for the resulting "semi-automated" process.

- Any processes handed off to I.T. have been kept in the "language of IT" from the beginning of the project, resulting in greatly decreased hand off and implementation times.

1.3 Business/Market Intelligence

Most projects generated by a knowledge-based position could be classified as either internal business intelligence or external market intelligence. In the last thirty years, computer science, statistics, and related fields have made huge strides in various techniques for generating intelligence that can be leveraged for strategic decision making, tactical monitoring, and new product/market identification and evaluation. Three general fields of inquiry that could be immediately leveraged are:

- Analysis, Modeling, and Simulation of various market conditions and processes including the quotation process, fleet dismantling, new product introduction, and macro market conditions.

- Forecasting, regression, and machine learning to predict the value of various business variables including customer inquiries, sales, repairs, and credit default.

- Clustering, comparisons, and link analysis to discover relationships between part types, aircraft types, vendor types, seasonality, market segments, and other business dimensions.

1.4 Leverage

Like all GE businesses, AMS has access to a great deal of expertise available in the wider GE universe. In addition, there is a huge pool of internal domain knowledge cultivated over years of experience. Any role that includes knowledge management or analytical services must include a mandate to leverage both forms of expertise. As a result:

- Looking across GE for best practices, data sources, and tools can provide some easy wins.

- Further examination of currently used external assets, including GECAS models and GRC deliverables, could provide extra value not currently being utilized.

- Seeking input across all AMS functions for large analytical projects would insure any output and deliverables are not necessarily lopsided. In addition, new ideas for analytical projects could be uncovered.

2 Position Description and Requirements

2.1 Business/Domain

Like any knowledge-based job (including I.T. and Finance), a great deal of internal business and domain knowledge would be required to effectively perform job duties. However, a more important consideration would be the ability of a candidate to leverage the domain expertise in the Inventory Management department and across the company.

2.2 Computational and Mathematical Modeling and Analytics

A large part of the position will involve creating, evaluation, applying, and updating mathematical models that would form the basis of large analytics and projects. In addition, application of computation modeling skills would be needed to complete most analytical projects involving "modern" simulation and machine learning techniques.

2.3 Software Engineering/Data Compliance

All project deliverables generated by this position must maintain compliance and be readily handed over to I.T. if they are deemed business critical. As a result, standard software engineering and project management skills should be utilized to maintain quality and reduce drag on hand-offs.

2.4 Possible Titles

- Knowledge Engineer/Analyst

- Business Intelligence Engineer/Analyst

- Analytics Engineer/Analyst

- Financial Engineer/Analyst

- Computational Finance Engineer/Analyst

3 Possible Projects

This is a brief list of possible projects for the proposed position.

Ad Hoc Analytical Queries Develop system to allow analytical exploration and deep dives without impacting ICS transactional processing or "stealing" I.T. time.

Inventory Query (AKA "Project Amazon") Allow free exploration of current and pending inventory by a variety of criteria (like the shopping experience on amazon.com)

Dashboarding Continuous metric identification refinement with little manual labor

"Gold Standard" Data Data cleaned, processed, and vetted for consistency, correctness, and compliance to be provided for both internal and external challenges. For instance, forecasting data that AMS could use to test any forecasting ideas they have. Similar, anonymized data could be provided to various crowdsourcing/consulting parties.

Pricing Develop pricing prediction models for audits to see if a price was entered in error (NOT the same as automated pricing)

Portfolio Optimization Using parameterized inputs (from expert what-if's, forecasting, inventory, skyline, etc.) determine product mix and its effect on forecasted sales versus an optimized product mix. What are the deltas and what are the smallest changes to current planning with largest effect?

"Lever" Modeling Combination of models and simulation to allow exploration of "levers we can pull", including price elasticity, inventory levels, marketing (including controlled inventory listing on ILS).

"Micro" Forecasting Apply trending (especially for the bid forecast), re-model the forecast by making quotations explicit.

"Macro" Forecasting Find market saturation points for aircraft types, explore relationships to major indices (including fuel spot pricing), leverage GRC fleet/price curve, find ways to leverage the "lag effect" (aviation pax/cargo often lags certain economic indicators and we often lag aviation pax/cargo).

ILS Data Leverage New models for using, interpreting, and driving various ILS statistics.

GRC Credit Modeling Find way to apply EBER modeling with more timely financials. (Make the credit modeling GRC project pay off).

IDD News Story sources Group similar news stories via language analysis for batch reading to lean out the current IDD process.

ACM Knowledge Leverage the work done with IPC's and "continuous trees" for our aircraft models.

Company Clustering Find ways to identify new sales leads by locating companies similar to top performers today.

Upselling Are certain parts more likely to sell when other parts are sold? Can this knowledge be used for upselling on the fly? Can alternate part information be leveraged?

Sales force game theory Use statistical scoring techniques to determine an ordering of salespeople who would be best when dealing with certain product types, aircraft types, and/or regions.

Note Analysis We create a tremendous amount of information via ICS "notes". Can computational linguistics and natural language analysis be used to extract and formalize some of this information?

Regulatory Textual Analysis Automated checking for possible problems (or market advantages) unique to our business created by the release of new FAA/EASA AD's or SAIB's.