

## **USING CRYSTAL BALL TO PREDICT HUMAN PERFORMANCE**

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### **ABSTRACT**

The wisdom of the book *Good to Great* by Jim Collins is to hire the best to do the work. Unfortunately, even the best find their jobs to be complex and demanding. There are also tyrannical assumptions that performance is the responsibility of the worker and that a job is 'do able' once created. In the face of static job models, Crystal Ball® software can be used to determine the probability that jobs can be performed given the complexity of competing demands and contexts. The dynamic analysis of jobs allows for the initial optimization of job structures and fluid changes in job design as the work environment changes. The same concepts can be applied to teams. Case studies will be used to demonstrate the simulation of job dynamics.

### **1 INTRODUCTION**

Human performance is hard to predict. The best we can do is estimate the probability that a behavior will happen. Moreover, it is easier to predict negative than positive behaviors with the effect that psychologists more often discuss 'why not' rather than 'why' a person should be in a job.

Predicting human behavior, however, has important consequences. In the work world, being able to predict human behaviors is important to designing jobs and choosing who to perform them. Jobs often seem unreasonably complex and demanding to the detriment of getting the work done. Unfortunately, the person doing the job is frequently blamed before the structure of the job is challenged. Predicting the workability of a job, however, is critical to ensuring that the job can be reasonably performed in the first place.

Likewise, conventional wisdom is to hire the best person to do a job. The question is, however, how to predict who is the best and estimate how well they will do in a job. Today's sophisticated evaluation tools, however, fall short of predicting how a person will actually perform.

### **2 IMPROVING JOB PREDICTION WITH SIMULATION**

Improved prediction of job performance has potentially important economic and social payoffs such as increased productivity and job satisfaction. One approach to improving the prediction of job performance is to use Crystal Ball software to predict the effectiveness of a job and of a candidate's fit for the job as if they were intangible assets.

Crystal Ball was useful to me when I was asked to help improve the performance of recently reconfigured IT Department. The new state-of-the-art departmental structure was done by competent IT professionals, but employees had difficulty adjusting to the new structure. This, however, was more than a failed transition from old to new. Closer investigation revealed that the nature of the jobs to be done were difficult to understand and/or adjust to even though the jobs were logically designed in the IT context.

Overtly, each person in the department had a new, difficult to comprehend, three- to four-page, single-spaced job description. Job descriptions, however, were easy to reconfigure into understandable formats. The real issue, however, appeared to be the 'do ability' of some of the jobs. One in particular, the IT Architect, looked suspiciously difficult. An approach was needed to demonstrate if the job could be reasonably done by a competent person in that setting. Crystal Ball was vital to the assessment of that job.

#### **2.1 Original Job Assessment**

The first step was to create a job model amenable to a Microsoft® Excel® spreadsheet, yet congruent with human perception and understanding. Using the definition of work as goal-oriented behavior, the job was divided into eight key results that

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were, in turn, subdivided into subordinate results that would be required to achieve the key results. In concept, the job could be reasonably done if each of the eight key results were reasonably done. Each result would be reasonably done if the subordinate results<sup>1</sup> were reasonably done.

Using the IT Architect job as a model<sup>2</sup>, the key and subordinate results were:

1. Strategy & Planning
  - a. IT Plan
  - b. Communicate
  - c. Preview/Adjust
  - d. Coordinate
  - e. Implement Plans
2. IT Team Time
  - a. Communication Dialogue
  - b. Understanding Job
  - c. Coordination, Accountability & Authority
  - d. Feedback
  - e. Support
3. Organization Processes & Needs
  - a. Vision, Mission & Objectives
  - b. Communication
  - c. Needs Assessment
  - d. Ideas/Proposals
  - e. Sales
4. Technology
  - a. Research Trends & Strategies
  - b. Pilot R&D Test
  - c. Benchmarking
  - d. Assess Ideas/Suppliers
  - e. Create Application
5. Self-Improvement
  - a. Professional Reading
  - b. Mentor
  - c. Plan
  - d. Workshops/Seminars
  - e. Continuing Education
6. Adjustment to New Role
  - a. Understanding of Job
  - b. Accountability & Authority
  - c. Relationship to Manager
  - d. Pilot Operational Changes
  - e. Review & Adjust Approach to Job
7. Project Applications
  - a. Quality
  - b. Oversight
  - c. Standards, Policies & Procedures
  - d. Handoff Applications
  - e. Enterprise Architecture Project
8. Financial Management
  - a. Recommend Allocations
  - b. Monitor Expenses
  - c. Overview Budget

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<sup>1</sup> Note that the subordinate results become the operational definition of the key results.

<sup>2</sup> This original job model analysis was not as sophisticated as current models and analyses, but represents the application of Crystal Ball to the process.

- d. Capital Proposals
- e. Forecast

## 2.2 Quantifying the Performance Factor

Next, the following three factors were estimated by several people familiar with the job for each of the Key Results:

1. The **importance** of accomplishing the Key Result.
2. The **difficulty** of accomplishing the result.
3. The **certainty** that a reasonably competent person could accomplish the result.

The estimates, in the form of percentages, ranged from low to high importance, difficulty and certainty. The average estimate of all judges for a factor was used as a score for the factor.

The average of the three factors for each Key Result, called a Performance Factor, was calculated to indicate the probability that the Key Result could be accomplished. Note, however, that high ‘Importance and Certainty’ factors contributed to a high probability of success, while a high ‘Difficulty’ factor would logically diminish success. To avoid this conflict, the inverse of the Difficulty factor was used in the Performance Factor equation.

Table 1: IT Architect Job Model

| Key Results                    | Importance | Difficulty | Inverse Difficulty | Certainty | Performance Factor |
|--------------------------------|------------|------------|--------------------|-----------|--------------------|
| Strategy and Planning          | 70%        | 90%        | 10%                | 50%       | 43%                |
| IT Team                        | 75%        | 90%        | 10%                | 50%       | 45%                |
| Organization Processes & Needs | 80%        | 75%        | 25%                | 75%       | 60%                |
| Technology                     | 80%        | 75%        | 25%                | 80%       | 62%                |
| Self-Improvement               | 50%        | 20%        | 80%                | 80%       | 70%                |
| Adjustment to New Role         | 100%       | 90%        | 10%                | 50%       | 53%                |
| Project Applications           | 50%        | 90%        | 10%                | 70%       | 43%                |
| Financial Management           | 50%        | 90%        | 10%                | 50%       | 37%                |

A triangular distribution was used to define the assumptions for each factor in the Performance Factor equation. The average estimate of all judges was used as the likeliest score and the minimum and maximum scores were set at 1% and 100% respectively.

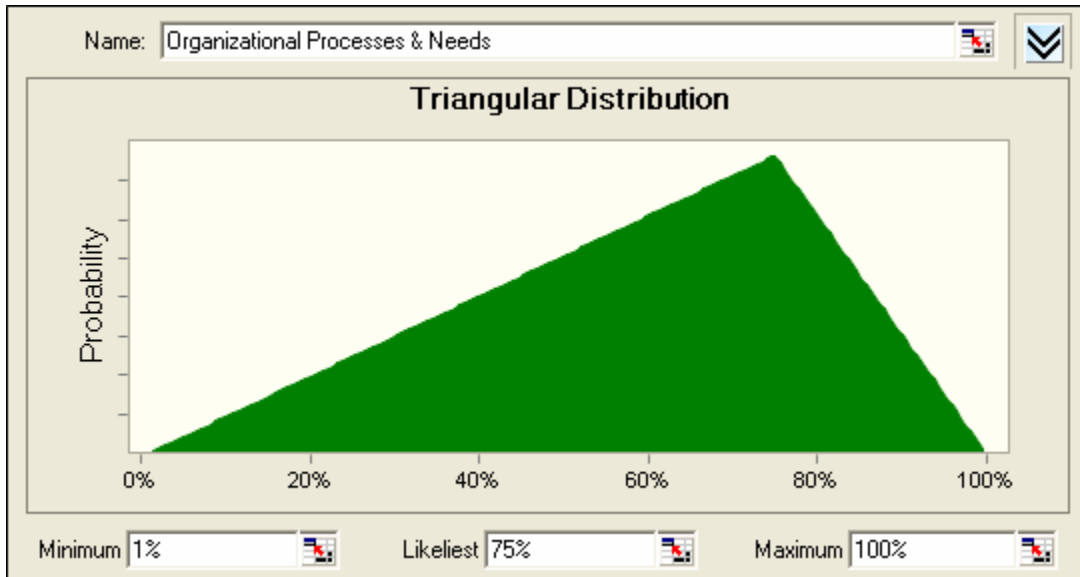


Figure 1: Example of Triangular Distribution

### 2.3 Analyzing the Simulation Results

A Performance Factor score of 50% was arbitrarily set as the minimum score indicating potentially successful performance of a Key Result. Crystal Ball software was used to determine the certainty of attaining that level of performance. A certainty level of 50% was arbitrarily used as the standard below which the Key Result could not be successfully performed.

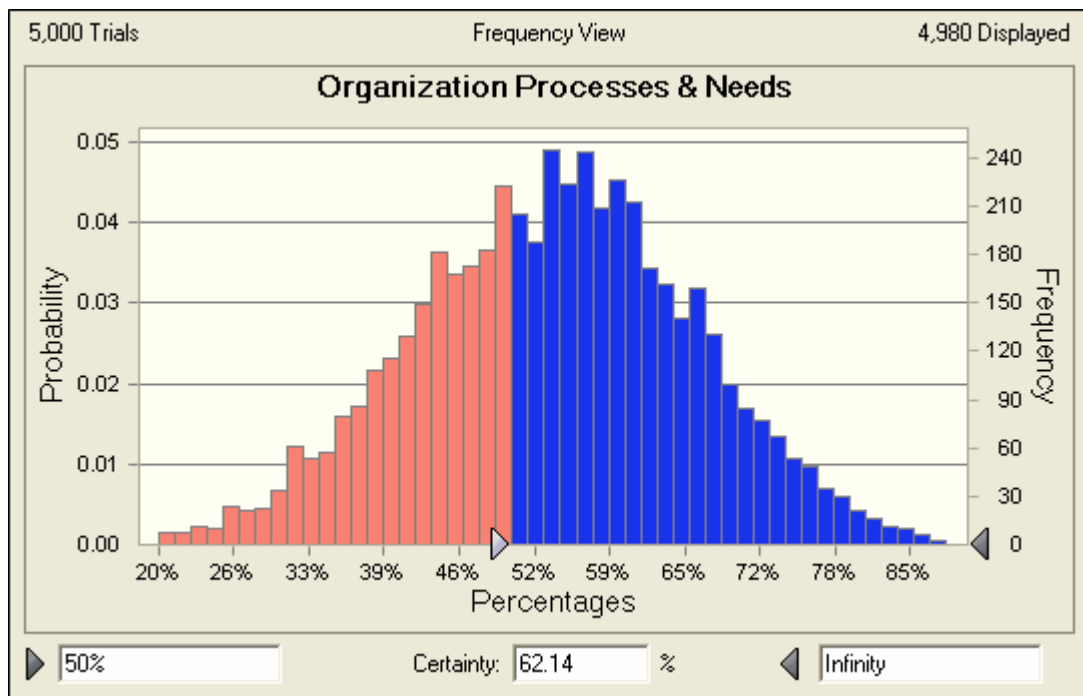


Figure 2: Example of Forecast Chart

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Prior to the analysis, an arbitrary guideline was set that a reasonable job would have six or more Key Results with the ‘certainty of performance at the 50% level’ at 50% or higher. Following that rule, as shown in Table 2, only four of eight Key Results have a ‘certainty of performance at the 50% level’ at 50% or higher. The inference is that the job was not likely to be done satisfactorily.

Table 2: Certainty of Key Results having a 50% or Higher Performance Factor

| Key Results                    | Certainty |
|--------------------------------|-----------|
| Self-Improvement               | 72%       |
| Technology                     | 65%       |
| Organization Processes & Needs | 62%       |
| Adjustment to New Role         | 52%       |
| IT Team                        | 45%       |
| Project Applications           | 44%       |
| Strategy & Planning            | 43%       |
| Financial Management           | 35%       |

In addition, a relatively weak 52% Certainty of performing the entire job at the 50% level is shown in Table 3. The job’s Certainty of Performance is the weighted average of Key Result certainties in proportion to time allocated to each one. A more robust overall Certainty of Performance of 60% or higher to reach a minimal 50% level of performance would not seem unreasonable.

Table 3: Certainty of Performing the Job at the 50% Level.

| Key Results                    | Certainty | Time Allocated | Weighted Average |
|--------------------------------|-----------|----------------|------------------|
| Self-Improvement               | 72%       | 5%             | 4%               |
| Technology                     | 65%       | 15%            | 10%              |
| Organization Processes & Needs | 62%       | 20%            | 12%              |
| Adjustment to New Role         | 52%       | 10%            | 5%               |
| IT Team                        | 45%       | 10%            | 5%               |
| Project Applications           | 44%       | 15%            | 7%               |
| Strategy & Planning            | 43%       | 20%            | 9%               |
| Financial Management           | 35%       | 5%             | 2%               |
|                                |           |                | <b>52%</b>       |

Note also the inverse relationship between the Performance Factor scores based on the original judges’ estimates of Importance, Difficulty & Certainty and the certainty of those scores as estimated using Crystal software in Table 4. While low scores are logically more attainable than high scores, high scores may be overestimated by judges. Crystal Ball simulation helps put the realism back into the likelihood of attaining a high score.

Table 4: Certainty of Original Performance Factor Scores

| Key Results                    | Performance Factor scores based upon judges’ estimates of Importance, Difficulty & Certainty | Certainty from Crystal Ball analysis |
|--------------------------------|--|--------------------------------------|
| Financial Management           | 37%  | 75%                                  |
| Project Applications           | 43%  | 65%                                  |
| Strategy & Planning            | 43%  | 64%                                  |
| IT Team                        | 45%  | 61%                                  |
| Adjustment to New Role         | 53%  | 44%                                  |
| Organization Processes & Needs | 60%  | 32%                                  |
| Technology                     | 62%  | 28%                                  |
| Self-Improvement               | 70%  | 14%                                  |

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The preceding was done by making very arbitrary decisions, but proved useful to understanding the nature of the job and the potential difficulty in performing it. Since then, the basic ideas have been expanded upon.

Job models have been refined to include what has to be accomplished, how it might be accomplished, and the resources necessary to accomplish the work. The factors used to assess jobs now cover the characteristics of the person doing and/or to be doing the job, other people connected to the job, the circumstances the job is to be performed under, the systems & processes need to support the job, and planning & preparation necessary to do the job. Moreover, these factors can be applied from a simple to a more thorough assessment of the job. Finally, variations in probability distributions, techniques to increase the reliability of assessment factors, and ways of differentially weighting factors are being tried.

### **3 CONCLUSION**

The overall value of the job model assessment technique is to provide useful information regarding how well a job might be done as it is structured, how the characteristics of a person might fit to a job, how dynamic changes in a job will effect the performance of the job and/or the well-being of the person doing the job, and how the job interacts with other jobs in the form of collaborative or team-oriented interactions. I believe that the job model assessment technique using Crystal Ball will prove useful in increasing the productivity of individuals, teams, and organizations.

### **BIOGRAPHY**

Dr. Eric Summons, Consulting Psychologist, and his firm, Selection Resource, have been recognized by many companies for providing services related to how people fit and function in the workplace. Specifically, his work is segmented into the selection of people for employment, the performance and development of individuals and teams, and the development of leaders and organizations.

Dr. Summons is licensed as a psychologist in Ohio and is a Diplomate of the American Board of Psychological Specialties with a specialty in Psychological Assessment, Evaluation & Testing. Further, he is a member of the American Psychological Association, Society of Consulting Psychology, Association for Psychological Science, American Production & Inventory Control Society, American Society for Quality, and The American College of Forensic Examiners.

Dr. Summons has served many different business and service organizations ranging from family-oriented to public enterprises. His work is tailored to what needs to be done to support the productivity of individuals and the organizations they work for. Moreover, confidentiality and discretion are paramount in his professional work as is being involved in a supportive role only to the extent that he can be helpful. Dr. Summons can be contacted at [esummons@selectionresource.com](mailto:esummons@selectionresource.com), (419) 893-8905 x114, or Selection Resource, 3231 Central Park West Drive, Suite 109, Toledo, Ohio 43617.