

# The Distribution of Yearly Bonus Money

A look at the allocation of monetary resources given as  
rewards to employees within ISD

By: Richard Craig and David Critten  
The George Washington University  
Executive Decision Making  
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## **Abstract**

Once per year, the managers of the Information Systems Division of the Department of the Treasury have the responsibility to equitably distribute money to employees as performance bonuses. Under the current bonus system, all employees that receive an annual rating above a specified point receive some amount of bonus money. Unfortunately, there are several problems with the system that prevent it from fulfilling its objectives. This paper will: (1) examine the bonus system in its current state, (2) identify and describe the flaws of that system, and (3) design and develop a new model to equitably distribute the bonus money.

## **Introduction**

Every year, the Information System Division managers have the responsibility to equitably distribute the allocated performance bonus awards. Currently, all employees with an overall rating of “Exceeds” or better and more than one year of service qualify for a 2% bonus. Those employees with less than a year of service and an “Exceeds” rating receive a \$150.00 bonus. Several problems are inherent in the system as it is now being used.

One of the authors of this paper, Richard Craig, is currently employed as an engineer in the Information Systems Division, where this bonus system is in use. While this allocation project has been developed for use as an academic exercise, it is also being developed with the practical intention of being presented to the managers of the division. It is hoped that management will see the improvement offered by this proposed bonus allocation system, and will choose to adopt its use for the next calendar year.

## **The ISD**

Within the Department of the Treasury (DOT) there is a division responsible for all of the Department's computer-based systems – the Information Systems Division (ISD).

The ISD's primary responsibility is to ensure that all electronic processing equipment is available on a constant basis for various bureaus of the DOT. This responsibility extends to all aspects of the DOT's networking system, such as data switches, routers, concentrators, workstations, servers, firewalls, and wiring. The ISD also manages all of the installation, operation and modification of this equipment. Furthermore, this division is responsible for the administration of several internal networks and the gateway that connects these networks to the larger Internet.

The ISD has additional responsibility for the operation and maintenance of all DOT communications equipment. This includes all of the facsimile machines, analog and digital telephones, telephone lines, and three Private Branch Exchange (PBX) telephone switches. In addition to equipment management, ISD managers also oversee any external sub-contractors involved with the installation or maintenance of the communication infrastructure.

As the data and communication needs of the DOT have increased over the past two years, so too has the demand for qualified information technology workers. To help alleviate the strain of this growth on the ISD, the DOT authorized the hiring of 95 new personnel at various levels throughout the division. This expansion increased the size of the ISD by almost 50% in two years.

## **The Current Situation**

With the recent growth spurt, the Information Systems Division has gained the necessary personnel to meet the responsibilities placed upon it by its parent organization. But with the demand for Information Technology professionals remaining high in all areas of business and government, the DOT needs to be concerned with retaining the employees it recently hired.

One method of keeping these employees satisfied is by using the DOT's existing yearly bonus system. This system was designed to fulfill two primary objectives of DOT management: to reward exceptional performance over the previous year, and to motivate employees' future performance.

### **Calculating the bonus**

Once per year, the performance of each employee is evaluated against the tasks established in his or her job description. The work accomplished is reviewed with respect to four major objectives ("Job Knowledge", "Communications", "Work Accomplishments", and "Other Duties as Assigned"), each of which has sub-objectives. For each of these many objectives, an employee is given an ordinal ranking ranging from one ("Unacceptable") to five ("Outstanding"). Upon completion of this multi-faceted evaluation, the overall performance of the employee is transformed into a single number. To accomplish this, the sub-objectives within a given major objective are averaged to give the major objective a ranking. When all top level objectives (excluding "Other Duties as Assigned") have been given an average ranking, these objectives are then also averaged together to produce an "Overall Final Rating" of one number.<sup>1</sup>

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<sup>1</sup> All words within quotations were taken as shown from the actual annual performance reviews.

At the end of each year, money to be used for annual bonuses is given to each branch of each division within the DOT. Within the ISD, the branch managers compile a list with each employee's name, their "Overall Final Rating", and their amount of time employed at the DOT. All employees whose final rating exceeds the value of 4.0 (a descriptive rating of "Exceeds") are given a bonus. The amount of this bonus depends on two criteria: the employee's length of service and annual salary. If the employee has been with the ISD for less than one year, the bonus is a fixed amount of \$150.00. For employees who have been with the division for longer than one year, the bonus is set to be 2% of that employee's annual salary.

### **Problems with the system**

Within this bonus system, there are several problems that keep it from meeting the objectives it was designed to fulfill. Again, these objectives are to reward performance and to act as a motivator for future performance.

In order to accurately and equitably reward an employee's performance, the system must correctly take into account the value of the work given by each employee. The first problem that the existing system has is the lack of derived weightings among the various objectives in the annual performance reports. The present system assumes that the first three objectives have equal value (33%) and that the fourth objective has no value (0%). With these weightings, the calculated final rating (and consequently the bonus) does not accurately reflect the performance of the employee. It makes intuitive and logical sense that different objectives will have different weightings, unlike the 33% assigned in the current model. Furthermore, it is incorrect to disregard one entire category of an employee's evaluation. If the objective were irrelevant, it

would not be included in the annual performance evaluation. This objective should therefore be used in the bonus system, even if it has a very small impact in the results.

The second problem is that the rating system averages ordinal numbers. Ordinal values are data values that can be ranked but do not show an interval. An example would be three competitive swimmers in a race. There would be a first, second and third place. Yet the time between first and second would not equal the time between second and third. Another example would be grade point averages. If the grade of 'A' is 4, and the grade of 'C' is 2, this does not mean that an 'A' is twice as good as a 'C'. The problem with the use of these ordinal numbers is that any further calculations would result in meaningless numbers. When they are used for other calculations, as they are in this bonus system, the calculations become incorrect and invalid.

The third problem that the existing bonus system has is that it may fail to motivate new employees. Under the right circumstances, it could even demoralize a new employee. For example, imagine an employee is hired on the second day of January, with an annual salary of \$50,000. This employee could contribute the best effort throughout the entire division for 364 days, but still be given a bonus of only \$150. When employees that are as valuable to the organization are given a bonus between ten and twenty times more than that given to the new employee, a bad signal is sent. In this situation, the current system not only fails to accurately reward superior performance, it fails to motivate future work.

As can be seen, there are some problems that prevent the bonus system from meeting its objectives. Because of the scope and importance of this problem, it is necessary to use a tool that can help both to structure and synthesize the data in this problem. Expert Choice decision support software, which uses the Analytic Hierarchy Process, was used to find a more equitable solution to this distribution problem.

The Analytic Hierarchy Process is a powerful tool to assist decision-makers. It helps the user to structure information and objectives into a comprehensive format by use of the hierarchy. It then forces the decision-maker to use relative judgements that result in derived weightings for each decision objective. Once each of the objectives and sub-objectives has been analyzed, the process synthesizes all of the judgements into a final package that shows the decision-maker the results of his judgements. In this case, the AHP was needed due to the complex nature of the decision being considered.

## Expert Choice Model

### Model Structure

Two important issues to consider when making a decision are the complexity of the decision and the amount of objectives used. Too few objectives can result in poor decisions, while a significant level of complexity and too many objectives can result in confusion. The list of criteria, or more correctly decision objectives, was large enough that it would be difficult if not impossible for a decision-maker to assimilate all of the objectives and data correctly using the unstructured approach. To combat this problem, the objectives were structured into a hierarchy. This hierarchy was based directly off of the criteria used for bonus allocation – the annual performance review form.

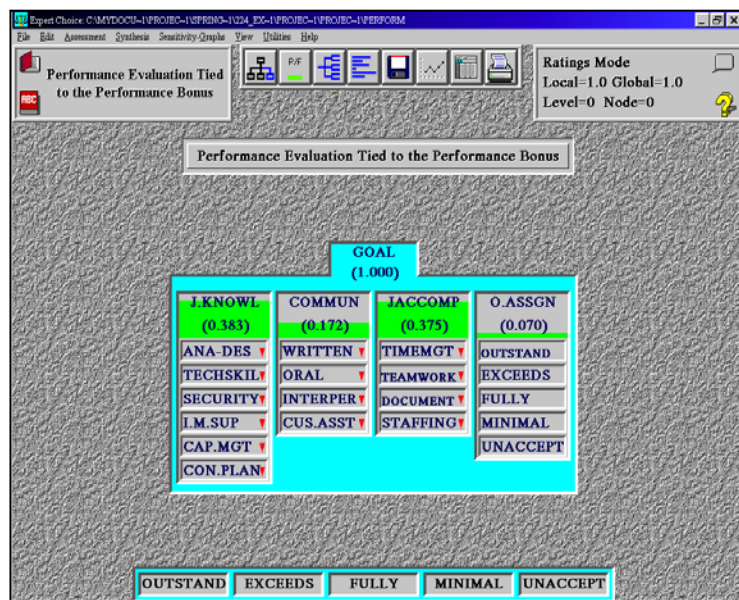


Figure 1 – The Hierarchy



As can be seen in Figure 1, there are four primary objectives within this model, exactly as they appear in the performance reports: “Job Knowledge”, “Communication”, “Job Accomplishment” and “Other Duties as assigned”. In Figure 1, these objectives appear directly beneath the Goal (blue area). Furthermore, underneath each of the first three objectives are the corresponding sub-objectives, which are also taken directly from the evaluation forms.

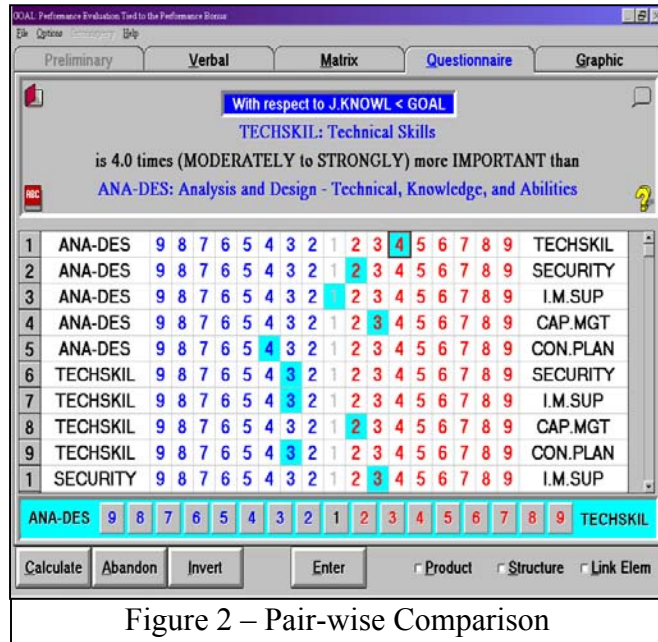


Figure 2 – Pair-wise Comparison

One of the problems with the current bonus system was that because it weighted the objectives incorrectly, the bonuses did not accurately reflect the contribution of employees. The Expert Choice software allows for this problem to be corrected. In the Analytic Hierarchy Process, each objective and sub-objective are analyzed by “pair-wise comparison”.

Comparing with the “pair-wise” approach (Figure 2) prevents the decision-maker from the errors of absolute judgements. This process allows the decision-maker to derive relative weightings that are much more accurate than the equal weightings used by the current bonus system. In Figure 2, A manager from the ISD gave inputs to the “pair-wise” comparisons used in this model by filling out a printed version of the software’s Questionnaire form.

One other aspect of the annual performance appraisal that needed to be added to the software was the rating intensities. Within each sub-objective, an employee is given an ordinal ranking of one (the worst) through five (the best). This is another source of inaccuracy within the current bonus system. Many follow-on calculations are performed from these ordinal

rankings that are actually not accurate. These calculations assume that someone who achieves a rating of “2” in a particular area is twice as valuable as another person who receives a “1” in the same area. This is simply not the case. To accurately reflect the value amongst the rating intensities, an ISD manager performed a "pair-wise" comparison on the alternatives (Figure 3).

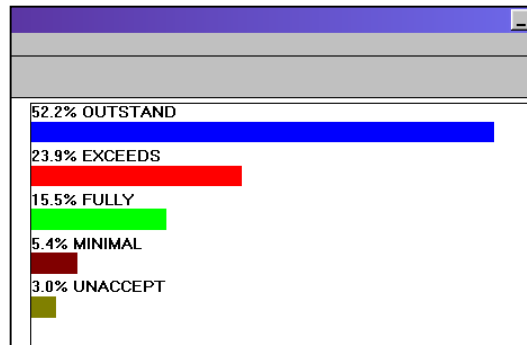


Figure 3 – Rating Intensities

### Ratings Model & Spreadsheet

After the Expert Choice model was completely formed, actual data from previous performance reports was loaded into the Expert Choice Ratings model. The ratings model

Alternatives	TOTAL	JKNOWL - ANA-DES	TECHSKIL	SECURITY	I.M.SUP	CAP.MGT
		0.410	1.066	0.389	0.655	1.111
1 Har, Charl	0.668	EXCEEDS	EXCEEDS	OUTSTAND	EXCEEDS	OUTSTAND
2 Lond, Pat	0.661	EXCEEDS	OUTSTAND	OUTSTAND	OUTSTAND	OUTSTAND
3 Craig, Rob	0.625	EXCEEDS	OUTSTAND	OUTSTAND	EXCEEDS	OUTSTAND
4 Smith, John	0.581	FULLY	EXCEEDS	EXCEEDS	OUTSTAND	EXCEEDS
5 Pay, Marc	0.567	OUTSTAND	EXCEEDS	OUTSTAND	EXCEEDS	OUTSTAND
6 Morr, Benj	0.558	OUTSTAND	FULLY	EXCEEDS	EXCEEDS	EXCEEDS
7 Smith, Cyn	0.547	EXCEEDS	EXCEEDS	EXCEEDS	EXCEEDS	EXCEEDS
8 Gardener, Jan	0.485	OUTSTAND	OUTSTAND	OUTSTAND	FULLY	EXCEEDS
9 Jone, Smyth	0.371	FULLY	FULLY	FULLY	EXCEEDS	EXCEEDS
10 Moore, Spain	0.356	FULLY	MINIMAL	EXCEEDS	FULLY	EXCEEDS
11 Tink, Char	0.352	FULLY	FULLY	FULLY	FULLY	FULLY
12 Chard, Salome	0.348	FULLY	FULLY	FULLY	FULLY	FULLY
13 Jordan, Emr	0.346	FULLY	FULLY	EXCEEDS	EXCEEDS	EXCEEDS
14 Spear, Stings Arrow	0.345	FULLY	FULLY	EXCEEDS	FULLY	EXCEEDS
15 Reynolds, Wrap	0.310	MINIMAL	FULLY	FULLY	FULLY	FULLY
16 Wash, Tub	0.300	MINIMAL	FULLY	FULLY	FULLY	FULLY

Figure 4 – Expert Choice Ratings Model

allows data to be easily entered from the performance reports. The employee’s name is entered, and then for each sub-objective the rating is entered by typing a one through five – exactly as it appears on the annual report. From the number, the corresponding word appears in each column along the row of the specified

employee. Such simplicity is an important factor in gaining acceptance of this model.

As each column of data is entered for an employee, the Ratings Model automatically sums the “Total”, as calculated from the derived weightings of objectives and intensities in the Expert Choice model. This total is then displayed in blue next to the employee’s name. A total of “1.0” would equal the perfect employee who received “Outstanding” in every category. The

total is a very powerful number, as it shows exactly how much each employee's performance is preferable to the other employees.

To perform further analysis and find a more equitable distribution of the bonus money, the Ratings model is imported into an Excel worksheet (Figure 5). Each employee's name is listed on the left side of the spreadsheet along with their base salary (as gathered from organizational pay charts). To the right of each salary figure is the contribution of each employee, as calculated by the Expert Choice software. Each branch manager within the ISD

receives an amount of money equal to two percent of the sum of employee base salaries from that branch with which to disperse bonuses. Any unused money is returned to the

	A	B	C	D	E	F	G	H	I	J	K	L
1					Employees to receive a bonus must not have received a rating of Minimal or Unacceptable in any category, and must have an EC derived contribution greater than or equal to .40							
2												
3												
4												
5			UnNormalized		No "1" or "2" ratings	Benefit >= .40	Receive Bonus	Normalized benefit	% of year at ISD	Distribution of Bonus	Percent of Base Salary	
6	Employees	Salary	Benefit									
7												
8	Har, Charl	\$49,488.00	0.6680		TRUE	TRUE	TRUE	0.1424	100%	\$1,977.13	4.00%	
9	Loud, Pat	\$58,849.00	0.6606		TRUE	TRUE	TRUE	0.1408	100%	\$1,955.20	3.32%	
10	Craig, Rob	\$52,681.00	0.6251		TRUE	TRUE	TRUE	0.1332	100%	\$1,850.18	3.51%	
11	Smith, John	\$47,891.00	0.5811		TRUE	TRUE	TRUE	0.1239	100%	\$1,720.04	3.59%	
12	Pay, More	\$60,747.00	0.5673		TRUE	TRUE	TRUE	0.1209	100%	\$1,679.21	2.76%	
13	Morr, Benj	\$47,891.00	0.5576		TRUE	TRUE	TRUE	0.1188	100%	\$1,650.54	3.45%	
14	Smith, Cyn	\$47,891.00	0.5469		TRUE	TRUE	TRUE	0.1166	100%	\$1,618.87	3.38%	
15	Gardener, Jan	\$35,228.00	0.4853		TRUE	TRUE	TRUE	0.1034	100%	\$1,436.49	4.08%	
16	Jone, Smyth	\$29,900.00	0.3706		FALSE	FALSE	FALSE	0.0000	100%	\$0.00	0.00%	
17	Moore, Spain	\$58,849.00	0.3565		FALSE	FALSE	FALSE	0.0000	100%	\$0.00	0.00%	
18	Tink, Char	\$29,900.00	0.3517		TRUE	FALSE	FALSE	0.0000	100%	\$0.00	0.00%	
19	Chard, Selone	\$34,127.00	0.3475		TRUE	FALSE	FALSE	0.0000	100%	\$0.00	0.00%	
20	Jordan, Emir	\$33,026.00	0.3456		TRUE	FALSE	FALSE	0.0000	100%	\$0.00	0.00%	
21	Spear, Slings Ar	\$33,026.00	0.3450		FALSE	FALSE	FALSE	0.0000	100%	\$0.00	0.00%	
22	Reynolds, Wrap	\$26,998.00	0.3104		FALSE	FALSE	FALSE	0.0000	100%	\$0.00	0.00%	
23	Wash, Tub.	\$47,891.00	0.3001		FALSE	FALSE	FALSE	0.0000	100%	\$0.00	0.00%	
24								1.0000		13,887.66		
25	Sum of Salaries	\$694,383.00										
26	times 2%		2.00%									
27	Amount for											
28	Performance	\$13,887.66										
29												

Figure 5 – Spreadsheet Calculations

organization for other purposes. The total amount of bonus money from this example is shown at the bottom left of Figure 5<sup>2</sup>.

This model puts three constraints on the distribution of bonus money. The first constraint is that no employee who received an “Unacceptable” (1) or “Minimal” (2) rating on any sub-objective shall receive a bonus (leftmost column in green highlight of Figure 5). The second constraint is that the employee must have an organizational contribution calculated by Expert Choice of .4 or greater. The third constraint is that the summation of money distributed must be less than or equal to the total amount allotted for bonus payments (bottom left of Figure 5).

In the light green box on the right side of Figure 5, the two left columns check the first two constraints of the model. All employees who qualify for the bonus then receive a value of “TRUE” in the “Receive Bonus” column. Next, the normalized benefit for each person receiving a bonus is calculated. To find the “Distribution of Bonus” for each employee, the normalized benefit is multiplied by the “Amount for Performance” (bottom left, Figure 5) and the “% of Year at ISD”. The effect of this last item is to prorate the amount of the bonus by the amount of time a new employee has worked within the division.

Another benefit from using this model is comparison of yearly data. From the spreadsheet calculations shown, it is a simple matter to compare the data of each employee from previous years to the current year. The benefit of this vertical analysis is that the contribution of each employee can be scrutinized to determine whether that employee’s contribution is increasing or decreasing compared to past performance. Such analysis is not used by this model, but might be of interest to managers of the ISD.

One last factor that is included in this model is that employees will not be severely penalized by moving into the ISD. Previously, any employee who qualified for a bonus and who had not been with the ISD for a full year was given a flat bonus of \$150. Under this new model, employees falling into this situation are given an amount of bonus money prorated by the number of days they have been working for the division. This prevents new employees that deserve a bonus from being unfairly penalized and de-motivated by a very small bonus.

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<sup>2</sup> If a manager wants to return a portion of the bonus money unused, constraints to the model can easily be changed.

## Results and Recommendations

As this paper has shown, there are several problems with the existing or current bonus system used at the Information Systems Division. These problems include:

- The use of ordinal scales for further calculations
- The inaccurate equal weighting of three objectives
- The inaccurate equal weighting of all sub-objectives
- Lack of consideration of one objective
- Discouragingly low bonuses for new employees
- Unmaximized use of money given to each branch for bonus payments.

These problems have previously prevented the bonus system from fulfilling the organization's goals of rewarding performance and motivating employees.

In the new model proposed in this paper, these problems have been addressed. The benefits of this model are:

- Ratings use is now based on derived weightings for all objectives
- All areas of the performance evaluation are considered
- Bonus payments are based on actual employee contributions to the organization
- Bonuses for new employees are based on a prorated system
- Maximizes the use of bonus money – pennies are returned to the organization instead of thousands of dollars

As these benefits show, this model offers a definite improvement over the old bonus system. The proposed model more closely attains the two organizational goals of the bonus system, reward and motivation.

A manager within the Information Systems Division is currently reviewing the model as developed by the authors of this paper. A presentation is being developed for higher level management that will outline a plan for a pilot test of this new system. It is our hope that approval and support for the model will be gained at this presentation, and that the pilot study will begin at the end of this calendar year.

## **Bibliography**

Ernest Forman, "Decision by Objectives", unpublished manuscript, Expert Choice, Inc., McLean, VA, 1996.