Improving Military Recruit Quality Through Smart Classification Technology

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1. Introduction

In times where recruiting objectives are hard to achieve, it is temping to lower entry standards in order to increase the proportion of applicants that are eligible for enlistment. This however, decreases the overall quality of the accepted recruits. By recognizing the distribution of aptitudes among the group of applicants along with the distribution of required aptitudes to qualify for the different vacancies, it becomes possible to improve the overall quality of enlisted recruits using smart allocation methods. Put in other words, optimizing person-job match, not only at the individual but also at the group level, allows to better capitalizing on the qualities available in the pool of applicants. Improved recruit quality has tremendous positive consequences to the Military community in general. Obtaining improved recruit quality at no extra costs using smart classification is therefore a goal worthwhile pursuing.

The purpose of the described research effort was to demonstrate the benefits of using sophisticated batch classification methods to improve the quality of enlisted Military personnel.

In order to reach the objective, this project used the Belgian Psychometric Model as a technology demonstrator. The aim was to use the Psychometric Model with actual selection data from different countries to show that it can improve the quality of the enlisted persons through smart allocation. A prerequisite of this approach is that recruitment encompasses vacancies requiring differential aptitudes.

2. Background

This research effort was initiated following the request made by Craig Dorman (ONR) at the International Applied Military Psychology Symposium in Split, Croatia, in September 2000. Craig Dorman quoted Admiral Vern Clark, US Chief of Naval Operations who said: 'My top 1 priority is recruiting Sailors, retaining Sailors and fighting the attrition of Sailors.' (Assuming the Watch, July 2000). He asked the IAMPS community to propose international collaborative research projects aimed at fighting the current military recruitment and retention problems experienced by many countries. The present research project was awarded at the 2001 IAMPS 'International Workshop on Military Recruitment and Retention' held in The Hague, The Netherlands, in April 2001. Its completion was made possible by the sponsorship of the US Office of Naval Research and the cooperation of dedicated colleagues from different countries who provided us with selection and classification datasets.

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3. Method

a. The Psychometric Model

The Psychometric Model is a smart classification tool developed by the author and his team and used for the classification of the Belgian NCOs since 1995. Although it would bring us too far to describe the tool exhaustively in this paper[2], some comprehension of its principles is useful for understanding the research results. The tool is meant for batch classification and requires a pool of applicants and a set of jobs. Identical jobs are clustered in 'trades' or 'entries'. Each trade can contain several identical jobs. On the applicant's side, the Psychometric Model uses selection variables (both metric and categorical) and preferences towards the different trades. For each entry, a minimum and/or maximum value can be set for each metric variable together with a weight. That weight can be considered as a beta weight used in multiple linear regressions. An initial payoff is computed for each applicant-trade combination as a weighted sum using the applicant's metric variable scores and the weights given to those variables for the trade. Applicants not meeting the set minima or maxima for a trade are rejected for that particular trade.

For each entry, for each categorical variable, a coefficient can be set for each class. Such a coefficient will then be used multiplicatively to adapt the initial payoff. Coefficients larger than one will be set for classes that are highly appropriate for the considered entry. For instance, a person who took training in mechanics (and belongs to that class) could get an increase of his payoff of 10% (coefficient = 1.1) for a trade such as 'Vehicle & Equipment Maintenance Apprentice'. Coefficients smaller than one will have the opposite effect. Coefficients zero will reject an applicant for the particular entry. For instance, a candidate who hasn't a specific security clearance (and thus belonging to a class 'no clearance' on the variable 'security status') can be rejected for an entry as 'Signals Intelligence Analysis Apprentice' by setting the coefficient for this combination to zero.

In a third step, the payoffs will be adapted again according to the applicant's preference towards the trade and the importance that is given to respecting the choices of the applicants. After that third step, we dispose of payoff values that represent the utility of assigning the applicant to a particular trade.

In the last step, we put all these payoff values in a matrix containing the applicants as row headers and the jobs as column headers. The matrix is squared by adding dummy jobs (or dummy persons) with payoff values set to zero. Then, by using an operational research algorithm, we link each applicant to a job in such a way that the sum of the payoffs of the applicants for the jobs they're assigned to is maximal. By doing so we capitalize as much as possible on the differential aptitudes and interests of the applicant pool to satisfy the different requirements of the different entries.

[2] For more detailed descriptions of the Psychometric Model, please refer to the bibliography. Copies of the papers can be made available. Contact the author for that purpose.

b. Research objective

For this research project it was intended to use the Psychometric Model as a technology demonstrator for smart classification. The purpose was to check whether the method would be beneficial for use in different military recruiting settings. Datasets were collected and processed with the Psychometric Model. The classification obtained by the Model was then compared to the actual classification obtained in the countries of origin. In this paper we review three datasets originating from respectively Portugal, Spain and the United States.

4. Results and discussion

a. The Portuguese data

(1) Description

The data was provided by Major Rui Ribeiro and originates from the recruiting of non-commissioned officers for the Portuguese Air Force in 2001. The set counts 261 applicant records. There were 478 vacancies for a total of 13 trades. The records include both selection data and the choices of the applicants (1^{st}, 2^{nd} and 3^{rd} choices). The assignment outcome was also given: from the 261 applicants, 162 were assigned to a job.

Portuguese Air Force data	
# Persons	261
# Available jobs	478
# Entries	13
# Assigned persons	162

The standards to assign persons to jobs were put in the Psychometric Model. The used weights were unit weights for the relevant variables. The choices in the dataset were expressed on an ordinal scale (1^{st}, 2^{nd}, 3^{rd} choice). Since the Psychometric Model uses preference data on a metric scale (from 99 down to 1) the applicants' choices were arbitrarily translated to 99 (first choice), 85 (second choice) and 70 (third choice). Interestingly enough, some applicants were assigned by the Portuguese Air Force to jobs that weren't one of their three choices. Obviously, these applicants will have accepted that trade, even if it was not one of their first choices. To allow the Psychometric Model to assign these persons to these jobs as well, we considered these entries as their fourth choice and gave it a metric value of 60. All other values were set to zero, excluding the possibility of assigning an applicant to these entries.

(2) Model 1 (PsyMod Portugal Data v1)

In this model, containing the original data and the selection criteria as we understood from the Portuguese documentation, something obviously went wrong. From the 261 applicants in the dataset, only three got a non-zero payoff and were accordingly assigned to a job. This indicates that our understanding of the selection rules was not correct since 162 persons were assigned to a job by the Portuguese Air Force, obviously meeting the requirements. It therefore was

decided to adapt the selection standards in the Model to those that were effectively used by the Portuguese. That was done in Model 2.

(3) Model 2 (PsyMod Portugal Data v2)

As said before, for this Model, the selection standards for the different trades were adapted. We went back to the original data and looked for each trade, at the minimum and maximum value in the distribution of scores of the persons assigned by the Portuguese Air Force to that trade. We did so for each variable and used these values as minimum or maximum values in the Psychometric Model. This means that the persons that will be assigned to a trade by the Psychometric Model have values for each variable that lay above the minimal value (or under the maximal value) the persons had that were assigned to the entry in Portugal. One can easily understand that these rules are more stringent than the ones used by the Portuguese Air Force. The vacancies were also modified to reflect the jobs that were filled in Portugal (n = 162). The next Model will then again use the 478 original vacancies.

After running the Model 2, we obtained following results.

	Original Portuguese Data	Psychometric Model #2
# Persons in dataset	261	261
# Entries	13	13
# Vacancies	162	162
# Persons assigned	162	162
Average payoff	477.44	492.93 (Δ NS)
Average rank of choice	1.30	1.30

In both cases, all jobs are filled. The Psychometric Model yields a somewhat better average payoff and respects the preferences of the applicants equally well.

(4) Model 3 (PsyMod Portugal Data v3)

In the third model, the original vacancies were used again. The other settings remained similar to the second Model. Following results were obtained.

	Original Portuguese Data	Psychometric Model #3
# Persons in dataset	261	261
# Entries	13	13
# Vacancies	478	478
# Persons assigned	162	197
Average payoff	477.44	467.64 (Δ NS)
Average rank of choice	1.30	1.39

Now, the Psychometric Model is able to assign more people in the dataset to a job than it was possible in Portugal. 23 applicants more could get a job (an increase of 14 %). The price to pay is a slight decrease in quality (average payoff 467 instead of 477, non-significant difference) but remember that all persons assigned to an entry have selection scores within the range of the persons accepted for that entry by the Portuguese Air Force. It should be noted that only

197 persons were assigned to a job and not the 261 applicants in the dataset since only 197 met the requirements for at least one entry.

(5) Conclusions for the Portuguese dataset.

When using the Psychometric Model on the Portuguese Air Force data, little change can be observed in comparison to the outcome in the original setting. When setting the vacancies to those that were filled in Portugal, these vacancies can be filled by the Psychometric Model and only a slight (non significant) increase of the average payoff is seen. On the other hand, when the original vacancies are used, then the Model is able to assign more persons to jobs than it was possible in Portugal. This is not surprising given the used methodology. In times where it is hard to achieve recruitment goals, this should be considered an important positive result.

b. The Spanish data

(1) Description

Capt Jose Puente gave the Spanish data. It contains 615 records. All 615 applicants in the dataset were assigned to a job. There were 49 different trades but the applicants were assigned to only 8 of them.

Spanish data	
# Persons	615
# Available jobs	615
# Entries	49 (8 effective)
# Assigned persons	615

The dataset contained the first two choices of the applicants. When checking the original data it appeared that 45 persons were assigned to jobs not mentioned as their first or second choice. Obviously it was possible to assign persons to other jobs than to their first two choices. In the Psychometric Model it was therefore decided to translate the choices to metric preferences as follows: first choice = 99, second choice = 80, other entries = 1.

(2) Model 1

The Model encompasses 615 persons and exactly the same number of vacancies. The vacancies were set to the jobs that the applicants were assigned to by the Spanish Military. The most important results of the classification by the Psychometric Model in comparison to the original classification in Spain are shown in the next table.

	Original Portuguese Data	Psychometric Model #1
# Persons in dataset	615	615
# Entries	8	8
# Vacancies	615	615
# Persons assigned	615	615
Average payoff	507,26	513,44 (Δ NS)

	Original Portuguese Data	Psychometric Model #1
# Persons getting their 1st choice	498	501
# Persons getting their 2nd choice	72	88
# Persons getting a trade other than their 1st or 2nd choice	45	26

(3) Conclusions for the Spanish data

The Psychometric Model is able to fill all vacancies but yields only a slight increase of average payoff (non-significant) and a little more respect of the applicants' choices.

c. The US Air Force data

(1) Description

This data was provided by Dr Paul DiTullio, Mary Ann Lightfoot and Ted Diaz. Actually two sets were given: one composed of 23578 records of enlisted personnel for the US Air Force in 1996 and the other one containing 29246 persons enlisted in 2000. 146 different trades (entries) were available and all persons in the dataset were all assigned to a job. For this report, only the 1996 dataset will be discussed.

US Air Force data 1996	
# Persons	23578
# Available jobs	23578
# Entries	146
# Assigned persons	23578

The dataset contained composite scores that determined whether or not an applicant was eligible for an entry. The dataset didn't contain variables referring to the trade preferences of the applicants. In the Psychometric Model, it was therefore assumed that the applicants were equally interested in all trades.

Gender and race were provided as categorical data. The assignment of females or persons belonging to an ethnic minority can be encouraged in the Psychometric Model by using a multiplicative coefficient larger than one. In this research however this was not necessary since in the dataset, the number of jobs equals the number of applicants. In such circumstances it is anticipated that all applicants get a job on the condition that the selection variables are unbiased for gender and ethnicity and that the standards to be eligible for the trades do not reject a too high proportion of the applicant pool.

Running the Psychometric Model on such a large dataset proved not to be feasible, due to limitations of the used hardware (1 GigaHertz processor and 256 MB RAM). A major problem is due to the fact that a matrix of dimension n has to be processed where n is the number of persons or jobs, whichever is largest.

In the case of the 1996 dataset, this would be a matrix containing 556 million cells! The classification algorithm has no limitations in terms of numbers that it can handle. Using a more powerful computer could therefore solve the problem. It is however unlikely that in real circumstances, a batch classification model will have to deal with such large numbers. Batch classification indeed supposes that applicants are assessed before the classification takes place. Assessing a large pool of applicants in order to get a large dataset for the classification will prove beneficial for the classification outcome but it has a price. The price is that the applicants who were assessed first will probably have to wait for a long time before they get the results of the classification. That is something we want to avoid. It would therefore be better to select a smaller amount of applicants and perform the classification more frequently.

In this research, we took subsets of the original dataset. We made three subsets and took the first 1000, 2000 and 3000 records of the original set[3]. The available jobs in the Psychometric Model were adapted to reflect the jobs that the applicants were originally assigned to in the US.

(2) Model 1 (USAF 1996 first 1k v1.bpm)

The 1000 jobs to which the first 1000 persons of the USAF 1996 dataset were assigned encompassed 128 different trades. The Model was run with the selection data and assignment rules given by the US Air Force.

US Air Force data 1996 (first 1000)	
# Persons	1000
# Available jobs	1000
# Entries	128
# Assigned persons	992

Only 992 jobs were filled with the first run of the Model. The 8 persons who didn't get a job had on average an AFQT[4] score that laid one and a half standard deviation below the average of the 1000 persons in the Model. They didn't meet the requirements for the jobs that were unfilled. The reason why these persons were not assigned to a job is that their payoff for the different trades was so low, that a better sum of payoffs could be reached without them than when assigning them to a job and having to reassign the person that they would take the place off. The table below gives the payoff-values these persons have for the job they got from the USAF assignment and shows what their maximal payoff is for any trade in the Psychometric Model. Given that the average payoff for each trade is set to 500 with a standard deviation of 200, one can easily see that these applicants were indeed poor performers.

[3] Records were sorted randomly in the original dataset.

[4] AFQT: The Armed Forces Qualification Test (AFQT) percentile is an overall measure of how well the applicant performed in the Armed Forces Vocational Aptitude Battery (ASVAB). This score is used to determine the initial qualification for or selection into the Air Force of an individual. It is not employed for AFSC eligibility after the inidividual meets the minimum qualifying AFQT.

Person-ID	Payoff for Job they were assigned to by the USAF	Maximum Payoff in PsyMod
199600001	147	174
199600146	121	227
199600418	159	159
199600198	352	386
199600234	194	237
199600543	154	284
199600702	178	364
199600169	0[5]	170

This can be considered as a drawback of the Psychometric Model compared to the actual assignment method used by the US Air Force. However, one has to consider that the setting is a bit artificial in the sense that the number of jobs matches the number of applicants. In a more typical situation where the number of applicants easily exceeds the number of jobs, this wouldn't be an issue.

After having run the Psychometric Model, we are in the possession of two datasets that can be compared. Both contain the same persons with the same selection variables and identical vacancies for which the same standards apply. One has the actual assignment performed by the US Air Force and the other one has the assignment proposed by the Psychometric Model. In order to assess the quality of the classification, we will compare two things that are possible with these two datasets.

One of the traditional ways of comparing the classification results is to look at the mean payoffs. While preparing the Psychometric Model, a payoff value is computed for each applicant-job combination. That payoff is the expression of how well the applicant is suited for the job. Per entry, the payoff-values are standardized with an average of 500 and a standard deviation of 200. 1 and 999 are the lower and upper limits. By looking at the average of the payoffs that the assigned applicants had for the jobs they were assigned to, we get an idea of how well the person-job match was realized by the used classification method.

Average of the payoffs that the assigned applicants had for the jobs they were assigned to.	
Original US Air Force Assignment	Psychometric Model Assignment
468,79	581,38

This is a quite impressive difference. On average, the payoff is more than half a standard deviation higher when using a smart classification system. A word of caution is needed though before jumping to conclusions. Since the original dataset didn't contain indications concerning the choices or preferences of the

[5] In our opinion, this person doesn't meet the requirements for the job she has been assigned to by the USAF. She was assigned to the trade 2W131E for which the minimal requirements are a score ≥61 for the Mechanical composite or a score ≥46 for the Electronics composite. This person however had scores 34 (Mech) and 31 (Elec). That is why the Psychometric Model considered the person as non-eligible for this trade and gave her a zero-payoff.

applicants, the Psychometric Model couldn't take these into account and had complete freedom in assigning an applicant to the best-suited job. In reality however, such a situation never occurs and it is quite clear that in the USAF assignment, the choices of the applicants did play a role that limited the degrees of freedom to reach an optimal assignment. The comparison is therefore probably biased but it would be quite hard to estimate to what extend. For further research, it is therefore recommended to include some measures of the applicants' preferences towards the different jobs.

The average payoffs per entry obtained by the two classification methods are given as an enclosure. When checking, one will see that for the 125 entries for which both methods assigned persons to, in 101 cases the Psychometric Model yields a higher average payoff, reflecting a better recruit quality.

A second way of comparing the original assignment method with the Psychometric Model is to have a look at the means of the variables that are considered relevant for each trade. We made the following table with that purpose in mind. The table reviews the different entries. For clarity and in order to avoid small numbers effects, we limited the table to those entries having 10 or more jobs. The columns represent from left to right:

- The Job-ID used in the Psychometric Model;
- The Job-name or AFSC used by the US Air Force;
- The number of jobs (that is the number of observations for the averages);
- The criteria that have to be met to be eligible for the entry. Some entries feature two criteria. When both have to be met, the second criteria is preceded by '&'. When only one of both has to be met, the second one is preceded by the word 'OR'. The criteria include GEN (for General composite), ADMIN (for Admin. composite), Mech (for Mechanical composite) and ELEC (for Electronics composite);
- The minimal acceptable value for the composite score given in the preceding column;
- The average score for the row criteria of the persons assigned by the US Air Force to the row job;
- The average score for the row criteria of the persons assigned by Psychometric Model to the row job.

Job-ID	Job-Name	Number of jobs	Criteria	≥ Value	Average USAF assignment	Average PsyMod assignment
20	1W031	15	ELEC	50	76.07	90.20
			& GEN	64	81.87	91.87
29	2A331B	10	ELEC	67	79.20	90.20
34	2A333A	18	MECH	51	72.94	84.28
35	2A333B	12	MECH	51	76.83	82.00
42	2A531A	12	MECH	51	75.17	78.33
44	2A531C	15	MECH	51	69.6	78.00
60	2A635	11	MECH	57	73.18	93.55
61	2A636	12	MECH	45	71.00	91.19
			& ELEC	60	76.92	89.42

Job-ID	Job-Name	Number of jobs	Criteria	≥ Value	Average USAF assignment	Average PsyMod assignment
64	2A733	17	MECH	51	70.71	77.18
77	2E633	14	ELEC	46	70.86	67.21
79	2F031	23	GEN	39	61.26	81.57
			& MECH	51	69.30	80.39
87	2S031	42	ADMIN	45	69.02	87.90
			OR GEN	43	43.79	63.43
88	2T031	13	ADMIN	40	71.92	79.92
90	2T231	11	ADMIN	32	68.45	86.36
			& MECH	51	68.73	65.36
95	2W031	44	MECH	61	66.91	60.00
			OR ELEC	46	68.23	65.41
97	2W131E	10	MECH	61	50.30	61.90
			OR ELEC	46	59.30	67.20
103	3A031	35	ADMIN	32	66.60	71.63
104	3C031	20	GEN	60	80.20	91.10
111	3E131	11	MECH	51	48.55	44.00
			OR ELEC	33	51.45	50.55
117	3E731	28	GEN	39	65.57	64.30
119	3M031	20	GEN	30	51.20	40.25
120	3P031	105	GEN	35	59.03	53.67
121	3P032	19	GEN	35	65.89	53.67
124	3S031	19	ADMIN	45	71.42	85.16
125	4A031	24	GEN	43	61.38	74.42
130	4D031	10	GEN	43	60.20	72.20
136	4N031	31	GEN	43	61.55	76.00
145	6F031	10	ADMIN	55	75.20	95.20
146	6F032	14	ADMIN	55	76.64	94.29

In the 37 pairs of averages, the Psychometric Model appears to yield better results in 27 pairs. Again, this should be taken with caution since the remark concerning the lack of interference of the applicants' preferences remains valid for these comparisons.

(3) Model 2 (USAF 1996 first 2k v1.bpm)

Another model was run containing the first 2000 applicants of the original 1996 dataset and the jobs to which these applicants were assigned by the US Air Force. Quite similar results were obtained. From the 2000 jobs, the Psychometric Model could fill 1998.

US Air Force data 1996 (first 2000)	
# Persons	2000
# Available jobs	2000
# Entries	138

US Air Force data 1996 (first 2000)	
# Assigned persons	1998

Comparing the average payoffs

Average of the payoffs that the assigned applicants had for the jobs they were assigned to.	
Original US Air Force Assignment	Psychometric Model Assignment
466,05	577,52

(4) Model 3 (USAF 1996 first 3k v1.bpm)

The same procedure was applied to the first 3000 applicants, again yielding very similar results.

US Air Force data 1996 (first 3000)	
# Persons	3000
# Available jobs	3000
# Entries	140
# Assigned persons	2986

Average of the payoffs that the assigned applicants had for the jobs they were assigned to.	
Original US Air Force Assignment	Psychometric Model Assignment
471,12	582,33

(5) Conclusions for the US Air Force dataset

The Psychometric Model encountered problems due to the size of the USAF dataset. These problems are due to hardware limitations and would most likely be solved when using more powerful computers. It is however not realistic to anticipate batch classification situations exceeding one, two or three thousand applicants and/or vacancies. Therefore, no attempt was made to overcome the hardware limitations.

In the three Models implemented for this research, the average payoff yielded by the Psychometric Model is markedly (more than half a standard deviation) and (of course) highly significantly better than what was obtained in the US. Since the dataset didn't include information concerning the applicants' preferences towards the different entries, it was not possible to take that information into account. It can reasonably be assumed that including the preference information in the Model would reduce the average payoff since it is unlikely that all applicants would agree to sign up for the job they're best fit for irrespective of their preference. The magnitude of that effect is hard to predict but based upon experience with other datasets it is most unlikely that this alone can explain the huge difference in average payoffs between the US outcome and the classification with the Psychometric Model.

5. Conclusions

Due to the impressive number of parameters involved in classification questions, it is quite difficult to model the outcome of particular classification settings. That is, unless very elementary and, as a consequence, much less powerful classification methods are used. It is therefore necessary to assess the power a classification method by testing it on a wide variety of classification problems and to compare its outcome to that of alternative methods. That is what was done with this research project. Based upon these particular datasets, we can conclude that the Psychometric Model did at least as well as the different methods it was compared to. In addition, it showed to be able to assign more people to jobs without decreasing the average payoff significantly or respecting the applicants' preferences less. In the case of the US Air Force dataset, the Psychometric Model showed to be able to improve the quality of the recruited applicants strikingly as is highlighted by the big difference in average payoff.

Future research should be carried out to increase the number of datasets used to demonstrate the benefits of smart classification. It should be recommended that such datasets include all eligible applicants and not only those who got a job in the original situation and that information concerning their preferences toward the entries would be included as well.

Classification methodologies deal with variables and business rules that are specific for particular countries or classification settings. Yet, the methodologies can easily be implemented in different countries or settings. Military recruitment settings are different to many civilian recruitment problems where multiple-job environments are more the exception than the rule. Classification technology is for these two reasons a topic that is very well suited for international military collaboration. It is therefore hoped that the research effort made possible by the US Office of Naval Research can be sustained in the future.

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Comparison of results from an 'External Method' and the 'Psychometric Model' classification
Recruitment session: PsyMod USAF 1996 first 1k v1
Number of entries: 146
Number of vacancies: 1000
Number of persons in model: 1000
Mean preference weight coefficient for Psychometric Model: 0,00

Review Entry '1': 1A231 G Number of jobs for this entry: 4

	External	PsyMod
Mean payoff:	502,81	701,02

Review Entry '3': 1A431 G Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	772,82	680,06

Review Entry '4': 1A531 E Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	802,59	813,95

Review Entry '5': 1C031 A Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	554,96	674,57

Review Entry '6': 1C032 A Number of jobs for this entry: 6

	External	PsyMod
Mean payoff:	457,49	676,78

Review Entry '7': 1C131 G Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	319,36	680,06

Review Entry '9': 1C331 G Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	316,33	679,39

Review Entry '10': 1C431 G Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	407,10	679,39

Review Entry '11': 1C531 G Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	370,89	680,06

Review Entry '12': 1N031 G Number of jobs for this entry: 6

	External	PsyMod
Mean payoff:	461,01	706,42

Review Entry '13': 1N131 G Number of jobs for this entry: 4

	External	PsyMod
Mean payoff:	463,78	850,21

Review Entry '16': 1N431 G Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	498,72	713,97

Review Entry '17': 1N531 G Number of jobs for this entry: 5

	External	PsyMod
Mean payoff:	528,43	885,82

Review Entry '18': 1N631 G Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	355,22	713,97

Review Entry '19': 1T131 G Number of jobs for this entry: 4

	External	PsyMod
Mean payoff:	533,31	251,81

Review Entry '20': 1W031 E Number of jobs for this entry: 15

	External	PsyMod
Mean payoff:	524,56	767,73

Review Entry '21': 2A031A E Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	416,56	840,44

Review Entry '22': 2A031B E Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	461,97	870,72

Review Entry '23': 2A131 E Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	598,03	

Review Entry '25': 2A133 E Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	848,01	802,59

Review Entry '27': 2A137 E Number of jobs for this entry: 4

	External	PsyMod
Mean payoff:	496,03	779,89

Review Entry '28': 2A331A E Number of jobs for this entry: 8

	External	PsyMod
Mean payoff:	391,01	677,70

Review Entry '29': 2A331B E Number of jobs for this entry: 10

	External	PsyMod
Mean payoff:	489,22	739,01

Review Entry '30': 2A331C E Number of jobs for this entry: 5

	External	PsyMod
Mean payoff:	525,55	639,10

Review Entry '31': 2A332A E Number of jobs for this entry: 5

	External	PsyMod
Mean payoff:	607,30	639,10

Review Entry '32': 2A332B E Number of jobs for this entry: 8

	External	PsyMod
Mean payoff:	632,28	694,73

Review Entry '33': 2A332C E Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	405,20	745,82

Review Entry '34': 2A333A M Number of jobs for this entry: 18

	External	PsyMod
Mean payoff:	517,20	693,83

Review Entry '35': 2A333B M Number of jobs for this entry: 12

	External	PsyMod
Mean payoff:	577,81	658,33

Review Entry '36': 2A333C M Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	595,99	705,09

Review Entry '37': 2A333E M Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	388,20	544,04

Review Entry '38': 2A333H M Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	198,58	705,09

Review Entry '39': 2A431 E Number of jobs for this entry: 5

	External	PsyMod
Mean payoff:	457,43	689,05

Review Entry '40': 2A432 E Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	340,86	704,19

Review Entry '41': 2A433 E Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	666,35	723,12

Review Entry '42': 2A531A M Number of jobs for this entry: 12

	External	PsyMod
Mean payoff:	551,84	601,19

Review Entry '43': 2A531B M Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	331,05	595,99

Review Entry '44': 2A531C M Number of jobs for this entry: 15

	External	PsyMod
Mean payoff:	465,08	595,99

Review Entry '45': 2A531D M Number of jobs for this entry: 7

	External	PsyMod
Mean payoff:	500,26	636,07

Review Entry '46': 2A531E M Number of jobs for this entry: 6

	External	PsyMod
Mean payoff:	468,72	619,37

Review Entry '47': 2A531F M Number of jobs for this entry: 5

	External	PsyMod
Mean payoff:	511,84	655,22

Review Entry '48': 2A531G M Number of jobs for this entry: 7

	External	PsyMod
Mean payoff:	498,03	618,26

Review Entry '49': 2A531H M Number of jobs for this entry: 5

	External	PsyMod
Mean payoff:	558,59	543,01

Review Entry '51': 2A533A E Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	496,03	620,93

Review Entry '52': 2A533B E Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	439,26	916,13

Review Entry '54': 2A631B M Number of jobs for this entry: 5

	External	PsyMod
Mean payoff:	520,39	811,49

Review Entry '55': 2A631D M Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	415,75	340,39

Review Entry '56': 2A631E M Number of jobs for this entry: 4

	External	PsyMod
Mean payoff:	343,81	374,64

Review Entry '57': 2A632 E Number of jobs for this entry: 8

	External	PsyMod
Mean payoff:	404,78	592,29

Review Entry '58': 2A633 M Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	490,81	845,80

Review Entry '59': 2A634 M Number of jobs for this entry: 9

	External	PsyMod
Mean payoff:	464,39	559,63

Review Entry '60': 2A635 M Number of jobs for this entry: 11

	External	PsyMod
Mean payoff:	470,37	831,82

Review Entry '61': 2A636 E Number of jobs for this entry: 12

	External	PsyMod
Mean payoff:	491,67	797,01

Review Entry '62': 2A731 M Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	751,84	471,31

Review Entry '63': 2A732 G Number of jobs for this entry: 6

	External	PsyMod
Mean payoff:	372,48	603,79

Review Entry '64': 2A733 M Number of jobs for this entry: 17

	External	PsyMod
Mean payoff:	482,32	583,16

Review Entry '65': 2A734 M Number of jobs for this entry: 4

	External	PsyMod
Mean payoff:	271,88	323,26

Review Entry '66': 2E031 E Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	552,80	643,64

Review Entry '67': 2E131 E Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	484,68	711,76

Review Entry '69': 2E133 E Number of jobs for this entry: 7

	External	PsyMod
Mean payoff:	452,24	796,11

Review Entry '71': 2E231 E Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	545,24	779,89

Review Entry '72': 2E231B E Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	643,64	

Review Entry '73': 2E331 E Number of jobs for this entry: 9

	External	PsyMod
Mean payoff:	530,10	714,28

Review Entry '74': 2E431 E Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	575,51	

Review Entry '75': 2E631 M Number of jobs for this entry: 4

	External	PsyMod
Mean payoff:	299,88	475,21

Review Entry '76': 2E632 M Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	367,42	507,68

Review Entry '77': 2E633 E Number of jobs for this entry: 14

	External	PsyMod
Mean payoff:	532,32	476,52

Review Entry '78': 2E831 E Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	212,18	689,05

Review Entry '79': 2F031 G Number of jobs for this entry: 23

	External	PsyMod
Mean payoff:	403,33	669,25

Review Entry '80': 2M031A E Number of jobs for this entry: 4

	External	PsyMod
Mean payoff:	637,96	813,95

Review Entry '81': 2M031B E Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	575,51	348,43

Review Entry '82': 2M032A M Number of jobs for this entry: 4

	External	PsyMod
Mean payoff:	459,63	673,92

Review Entry '84': 2P031 E Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	484,68	757,18

Review Entry '85': 2R031 G Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	458,49	690,37

Review Entry '86': 2R131 G Number of jobs for this entry: 4

	External	PsyMod
Mean payoff:	273,19	610,34

Review Entry '87': 2S031 G Number of jobs for this entry: 42

	External	PsyMod
Mean payoff:	350,14	615,61

Review Entry '88': 2T031 A Number of jobs for this entry: 13

	External	PsyMod
Mean payoff:	500,75	600,44

Review Entry '89': 2T131 M Number of jobs for this entry: 7

	External	PsyMod
Mean payoff:	285,58	352,13

Review Entry '90': 2T231 A Number of jobs for this entry: 11

	External	PsyMod
Mean payoff:	457,13	593,96

Review Entry '91': 2T331 M Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	424,56	590,80

Review Entry '94': 2T431 M Number of jobs for this entry: 4

	External	PsyMod
Mean payoff:	572,62	584,31

Review Entry '95': 2W031 E Number of jobs for this entry: 44

	External	PsyMod
Mean payoff:	527,35	468,99

Review Entry '96': 2W131C E Number of jobs for this entry: 9

	External	PsyMod
Mean payoff:	496,79	456,94

Review Entry '97': 2W131E E Number of jobs for this entry: 10

	External	PsyMod
Mean payoff:	360,64	493,60

Review Entry '98': 2W131F E Number of jobs for this entry: 9

	External	PsyMod
Mean payoff:	565,23	449,33

Review Entry '99': 2W131K E Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	874,27	336,85

Review Entry '100': 2W131L E Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	579,78	611,36

Review Entry '102': 2W231 M Number of jobs for this entry: 6

	External	PsyMod
Mean payoff:	638,10	901,27

Review Entry '103': 3A031 A Number of jobs for this entry: 35

	External	PsyMod
Mean payoff:	461,54	518,79

Review Entry '104': 3C031 G Number of jobs for this entry: 20

	External	PsyMod
Mean payoff:	556,57	762,65

Review Entry '105': 3C032 G Number of jobs for this entry: 8

	External	PsyMod
Mean payoff:	718,22	770,22

Review Entry '106': 3C131 A Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	317,95	670,14

Review Entry '107': 3C231 E Number of jobs for this entry: 7

	External	PsyMod
Mean payoff:	487,92	685,81

Review Entry '109': 3E031 E Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	696,08	331,73

Review Entry '110': 3E032 E Number of jobs for this entry: 5

	External	PsyMod
Mean payoff:	391,33	698,54

Review Entry '111': 3E131 E Number of jobs for this entry: 11

	External	PsyMod
Mean payoff:	359,89	330,46

Review Entry '112': 3E231 M Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	431,73	326,69

Review Entry '113': 3E331 M Number of jobs for this entry: 8

	External	PsyMod
Mean payoff:	502,48	467,42

Review Entry '114': 3E431 M Number of jobs for this entry: 6

	External	PsyMod
Mean payoff:	414,17	499,89

Review Entry '115': 3E432 M Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	258,32	512,87

Review Entry '117': 3E731 G Number of jobs for this entry: 28

	External	PsyMod
Mean payoff:	507,59	499,71

Review Entry '118': 3E831 G Number of jobs for this entry: 4

	External	PsyMod
Mean payoff:	650,95	882,94

Review Entry '119': 3M031 G Number of jobs for this entry: 20

	External	PsyMod
Mean payoff:	358,61	231,49

Review Entry '120': 3P031 G Number of jobs for this entry: 105

	External	PsyMod
Mean payoff:	439,63	375,70

Review Entry '121': 3P032 G Number of jobs for this entry: 19

	External	PsyMod
Mean payoff:	521,49	373,40

Review Entry '122': 3P032A G Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	594,28	367,76

Review Entry '123': 3P131 M Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	318,99	861,80

Review Entry '124': 3S031 A Number of jobs for this entry: 19

	External	PsyMod
Mean payoff:	477,48	658,95

Review Entry '125': 4A031 G Number of jobs for this entry: 24

	External	PsyMod
Mean payoff:	425,40	596,15

Review Entry '126': 4A131 G Number of jobs for this entry: 9

	External	PsyMod
Mean payoff:	365,20	602,33

Review Entry '127': 4A231 E Number of jobs for this entry: 4

	External	PsyMod
Mean payoff:	740,15	620,93

Review Entry '128': 4B031 G Number of jobs for this entry: 6

	External	PsyMod
Mean payoff:	376,84	702,66

Review Entry '129': 4C031 G Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	332,25	710,98

Review Entry '130': 4D031 G Number of jobs for this entry: 10

	External	PsyMod
Mean payoff:	410,01	567,13

Review Entry '131': 4E031 G Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	800,18	603,79

Review Entry '132': 4F031 G Number of jobs for this entry: 5

	External	PsyMod
Mean payoff:	462,38	574,98

Review Entry '133': 4H031 G Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	302,65	616,88

Review Entry '134': 4J032 G Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	553,72	693,36

Review Entry '136': 4N031 G Number of jobs for this entry: 31

	External	PsyMod
Mean payoff:	427,67	572,11

Review Entry '137': 4N131 G Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	464,13	608,15

Review Entry '138': 4P031 G Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	564,51	643,07

Review Entry '139': 4R031 G Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	538,32	643,07

Review Entry '140': 4T031 G Number of jobs for this entry: 1

	External	PsyMod
Mean payoff:	893,34	713,97

Review Entry '142': 4V031 G Number of jobs for this entry: 2

	External	PsyMod
Mean payoff:	216,31	710,98

Review Entry '143': 4Y031 G Number of jobs for this entry: 6

	External	PsyMod
Mean payoff:	409,57	643,07

Review Entry '144': 6C031 G Number of jobs for this entry: 3

	External	PsyMod
Mean payoff:	547,24	876,42

Review Entry '145': 6F031 A Number of jobs for this entry: 10

	External	PsyMod
Mean payoff:	450,92	791,22

Review Entry '146': 6F032 A Number of jobs for this entry: 14

	External	PsyMod
Mean payoff:	491,95	776,17

Summary for all entries
Number of entries with more than 0 jobs: 128
Number of jobs for this model: 1000

	External	PsyMod
Total assigned:	1000	992
Shortfall:	0	8
Mean payoff:	468,79	581,38