IMPROVING MILITARY RECRUIT QUALITY

THROUGH

SMART CLASSIFICATION TECHNOLOGY

Final Report of an International Collaborative Research Project under Leadership of the Belgian Defense and Sponsored by the US Office of Naval Research
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EXECUTIVE SUMMARY

The purpose of this 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 this system with actual selection data from different countries to show that it can improve the quality of the enlisted persons through smart classification. In this report we review three datasets originating from respectively Portugal, Spain and the United States.

The table below illustrates the core of what is meant by the title of this research project. The two compared classification methods deal with the same applicants for the same vacancies. Both methods fill the vacancies. Yet, the available indicators of the Military recruit quality (in this example, the relevant composite scores) are significantly better when the classification is done by a smart classification system such as the Psychometric Model.

Composite	USAF Assignment		Psychometric Model Assignment		Difference in average
	# observations	Average	# observations	Average	
Mechanical	7826	69.19	7826	73.80	+4,6
General	10608	62.75	10608	68.82	+6,06
Electronics	6050	73.57	5924	77.42	+3,85
Admin	3587	69.99	3587	85.16	+15,17
Total	28071		27945		

The benefits of using such a method should be estimated by comparing the costs of implementing it versus the costs of alternative methods needed to reach a similar quality increase, such as increased advertising, recruitment bonuses etc. Given the marginal costs of smart classification, there is little doubt that using such a method is the easiest way to augment recruit quality.

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 of 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.

Future research should be carried out to increase the number of datasets used to demonstrate the benefits of smart classification. It is 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 towards 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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Improving Military Recruit Quality Through Smart Classification Technology

Francois Lescreve
Belgian Defense Staff
Human Resources Directorate General
Accession Policy Research Section[1]

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 (Office of Naval Research (ONR) at the International Applied Military Psychology Symposium (IAMPS) 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 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.

[1] To contact the author: e-mail: lescreve@skynet.be or Francois.Lescreve@mil.be , Phone: +32 2 264 5751, Fax: +32 2 264 5729

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 necessary 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 compared to 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 standardized 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 a variable 'security status') can be rejected for an entry like '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.

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[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 report we review three datasets originating from respectively Portugal, Spain and the United States. A fourth dataset originating from the Czech Republic couldn't be included since it didn't encompass the trade to which the applicants were assigned to in the Czech Republic. This prevented us to make the comparison of the quality obtained by the Psychometric Model versus the original classification method.

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[3] vacancies for a total of 13 trades. The records include both selection data and the choices of the applicants (1st, 2nd and 3rd 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

Table 1

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 (1st, 2nd, 3rd 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.

[3] It was reported that the number of vacancies was much larger than the number of applicants because the number of vacancies included all jobs for the current year whereas the applicants do not represent the applications for a complete year.

(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 in previous paragraph, 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 that were assigned to the entry in Portugal had. 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

Table 2

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

Table 3

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 Psych Jose Puente provided us with 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

Table 4

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)
# 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

Table 5

(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 in coordination with Dr Paul DiTullio, Dr 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. For this report, only the 1996 dataset will be discussed. 146 different trades (entries) were available and all persons in the dataset were all assigned to a job

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

Table 6

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. We will discuss that assumption later.

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 reasonably 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[4]. The available jobs in the Psychometric Model were set to reflect the jobs that the applicants were originally assigned to in the US.

(2) Model 1 (USAF 1996 first 1k)

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

Table 7

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

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[5] 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.

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[6]	170

Table 8

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 scores and identical vacancies for which the same standards apply. One originates from the actual assignment performed by the US Air Force and the other one from 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

[5] 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 trade (AFSC) eligibility after the inidividual meets the minimum qualifying AFQT.

[6] 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.

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

Table 9

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 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 trades.

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
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	53.47
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

Table 10

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)

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
# Assigned persons	1998

Table 11

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

Table 12

(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

Table 13

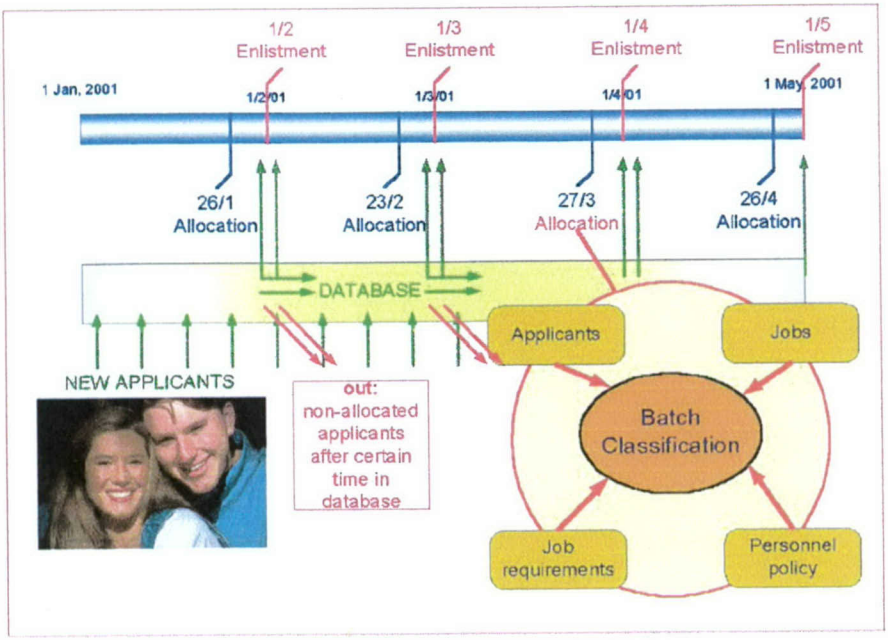
Comparing the average payoffs:

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

Table 14

(5) Further investigations

During the research process, the idea grew that it would be worthwhile to simulate a situation in the US where Air Force applicants would be assigned to jobs using a frequently run batch classification system.



Graph 1

To simulate such an approach, we processed the 1996 dataset sliced in parts of 1000 persons. Given the total number of 23578, that gives us 23 groups of 1000 applicants and one group of the remaining 578. Conceptually, this would be equivalent to having a continuous selection process and a batch classification approximately every fortnight. It is trivial that such a procedure yields a less powerful solution than processing the whole group together but as mentioned earlier, this could be a more practical scenario.

When comparing the results at the payoff level between the classification methods for the different subgroups, we get a confirmation of the results reported in the preceding sections. The next table shows for the assigned applicants, their mean payoff for the trade they were assigned to by the two compared methods.

Applicants	USAF Assignment		PsyMod Assignment		Difference in payoff
	# Assigned	Average Payoff	# Assigned	Average Payoff	
K1 (# 0001-0999)	1000	468.79	992	581.38	+112.9
K2 (# 1000-1999)	1000	463.31	994	574.24	+110.93
K3 (# 2000-2999)	1000	466.06	997	574.29	+108.23
K4 (# 3000-3999)	1000	475.67	992	580.30	+104.63
K5 (# 4000-4999)	1000	468.82	993	578.63	+109.81
K6 (#5000-5999)	1000	464.08	996	576.32	+112.24
K7(# 6000-6999)	1000	471.11	995	580.47	+109.36
K8 (# 7000-7999)	1000	473.90	995	580.58	+106.68
K9 (# 8000-8999)	1000	466.49	992	583.21	+116.72
K10 (# 9000-9999)	1000	478.05	995	581.27	+103.22
K11 (# 10000-10999)	1000	475.33	991	590.39	+115.06
K12 (# 11000-11999)	1000	469.48	997	574.36	+104.88
K13 (# 12000-12999)	1000	464.61	993	574.77	+110.16
K14 (# 13000-13999)	1000	467.78	997	580.56	+112.78
K15 (# 14000-14999)	1000	470.56	996	574.25	+103.69
K16 (# 15000-15999)	1000	464.22	992	577.37	+113.15
K17 (# 16000-16999)	1000	467.23	987	581.25	+114.02
K18 (# 17000-17999)	1000	479.50	1000	586.61	+107.11
K19 (# 18000-18999)	1000	462.37	995	575.30	+112.93

Applicants	USAF Assignment		PsyMod Assignment		Difference in payoff
	# Assigned	Average Payoff	# Assigned	Average Payoff	
K20 (# 19000-19999)	1000	481.80	995	586.38	+104.58
K21 (# 20000-20999)	1000	477.33	995	580.35	+103.02
K22 (# 21000-21999)	1000	471.50	997	589.98	+118.48
K23 (# 22000-22999)	1000	467.46	998	572.44	+104.98
K24 (# 23000 – 23578)	578	475.91	578	575.33	+99.42
Total	23578	470.38	23452	579.66	+109.28

Table 15

The 'payoffs' shown in the previous table are values that are internal to the classification system. Within each trade, the raw payoff values of the applicants meeting the requirements to be eligible for the trade are standardized to a mean of 500 and a standard deviation of 200. As such, the payoffs are not suitable to be incorporated in broader evaluation systems that would encompass elements such as the effect of recruitment efforts on applicant quality or the relationship between applicant quality and training costs.

For that purpose, it is necessary to go back to the original selection variables. In the considered dataset, these are the composite scores Mechanical, General, Electronics and Admin. We will look at the composites that are considered relevant for the trades. These are the composites for which a minimum value is set, thus defining who is eligible for assignment to the trade. In attachment C, a comparison is given of the average score for the relevant composites yielded by the USAF and the Psychometric Model classification for each trade. Next table gives a summary of the attachment. Here, we show the averages for each relevant composite over the different trades. In the first row for instance we look at the Mechanical composite score. The 'number of observations' column refers to the number of persons that were assigned to a trade for which a minimum score was set for the Mechanical composite. The total number of observations is larger than the number of persons in the dataset because there are trades for which more than one composite score is considered relevant.

Composite	USAF Assignment		PsyMod Assignment		Difference
	# observations	Average	# observations	Average	
Mechanical	7826	69.19	7826	73.80	+4,6
General	10608	62.75	10608	68.82	+6,06
Electronics	6050	73.57	5924	77.42	+3,85
Admin	3587	69.99	3587	85.16	+15,17
Total	28071		27945		

Table 16

This table illustrates the core of what is meant by the title of this research project. Remember that the two compared classification methods consider the same applicants for the same vacancies. Both methods fill the vacancies[7]. Yet, the available indicators of the Military recruit quality (in this example, the relevant composite scores) are significantly better when the classification is done by a smart classification system such as the Psychometric Model. The benefits of using such a method should be estimated by comparing the costs of implementing it versus the costs of alternative methods needed to reach a similar

[7] As mentioned earlier, the Psychometric Model does not fill all vacancies but 'only' 99.5 %. As was explained, this is most likely due to the fact that the number of applicants equals the number of vacancies, which is an exceptional situation.

quality increase, such as increased advertising, recruitment bonuses etc. Given the marginal costs of smart classification, there is little doubt that using such a method is the easiest way to augment recruit quality.

Another issue we wanted to investigate further is that of the vacancies unfilled by the Psychometric Model. Out of the 23578 vacancies, 126 are left unfilled. When reviewing the different Models containing 1000 jobs and applicants each, it became clear that the unfilled vacancies were not randomly distributed. The worst problem for instance, occurred for Job-ID 23 (trade 2A131) for which the Psychometric Model only filled 8 out of the 77 vacancies. In the Model K5 containing the applicants with ID 199604000 to 199604999, there were 8 vacancies for Job-ID 23 and 354 persons with a payoff larger than zero. Still, only one vacancy was filled. If such a situation is unacceptable to the recruitment manager, he has options to solve it. The Psychometric Model indeed features the possibility to set a higher priority for specific trades. By doing so, the payoff values for that trade are multiplied by the priority. Priorities larger than one will increase the payoffs and that results in a higher probability of assigning a person to that trade. This usually solves the problem of unfilled vacancies for a particular trade (given that there are enough persons meeting all requirements for that trade). Yet, this does not necessarily means that the overall number of unfilled vacancies will be lower. For instance, we can look at what happens in the Model K5 when we set the priority for Job-ID 23 to 2. When the Model is run with that priority, all 8 vacancies for Job-ID 23 are filled (and the manager's problem seems to be solved), but 6 out of the 7 persons who didn't get a job in the first place are still not assigned to a job[8]! Now, 6 vacancies from different trades are not filled. In summary, the use of priorities usually can influence for what trades unfilled vacancies occur but not necessarily lower the overall number of unfilled vacancies.

(6) 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 or an alternative optimization algorithm. 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 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

8

Persons not assigned in Model K5	Not assigned persons in K5 with Priority 2 for Job-23
199604340	199604340
199604421	199604421
199604598	199604598
199604834	199604834
199604672	199604672
199604364	199604364
199604800	

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 marked 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 of 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 is 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.

6. Addendum: The Sequential Parallel Assignment Method, a valuable alternative?

a. Introduction

While the collaborative research was conducted, the Belgian Minister of Defense initiated a working group with the objective of proposing him a general concept for the selection and classification of Military personnel. During the course of the workgroup, the classification issue was discussed and the Belgian Royal Military Academy (RMA) proposed an alternative method for the Psychometric Model. The main reason why the RMA wanted an alternative is because they consider the Psychometric Model to be too much of a 'black box' that does not ensure the best applicants to get their first choice. The RMA is clearly not interested in the mean aptitude of the enlisted applicants or the respect of the preferences of the enlisted group. The RMA is interested in the 'best' applicants. They must get the guarantee that they will be assigned to the entry they seek. The Psychometric Model considers

all enlisted applicants as being equally important to the Military. A difference in philosophy can indeed lead to a difference in preferred technique.

b. Method

The method proposed by the RMA is called the 'Sequential Parallel Assignment Method'. Its starting point is quite similar to the one in the Psychometric Model. For each entry, a payoff is computed as a weighted sum of metric variables. The Sequential method as conceived by the RMA does not accept the use of categorical variables. The preference of the applicants for the different entries is expressed on an ordinal scale. Once all applicants completed the selection procedure, a table is made for each different entry. The tables contain three fields: the person identification, the payoff and the rank of their preference for the table-entry (a value 1 indicates that the entry is the first choice of the applicant, 2 is his/her second choice, etc). The tables are sorted in descending order of the payoff. When an applicant is not interested at all in the entry, zero replaces his/her payoff. The next figure shows an example of such tables.

Entry A

PERSON_ID	PAYOFF	RANK
84111702743	631,620426843072	1
84061018758	616,24986109046	1
83111614135	611,429062799693	1
84012725329	610,653668318389	1
82101535913	610,527902066265	1
83120506956	591,731471799733	1
82051419575	574,785455860459	1
84011112159	567,904286597929	1
84081011844	566,020873249457	1
83042710184	553,55413589258	2
84022414342	523,539530466325	1
84030909364	467,337602558106	1
83112622737	332,634486514898	1
84032327346	319,503840874053	1
83090319863	262,395273485939	1
84122209922	256,941672919938	1
82082803332	256,068943146523	2
83122838520	243,724091845221	2
84052726050	156,905453021395	3
84051408137	25,5153205882119	2
83031129770	0	2
83030122752	0	3
83022522704	0	1
83021733737	0	6

Table 17

Entry B

PERSON_ID	PAYOFF	RANK
84061018758	612,825472017944	2
83111614135	606,514116992172	2
82051419575	593,782770773866	3
84011112159	593,744808692962	2
82101535913	591,792082342136	2
83120506956	588,230408677886	2
84081011844	572,532302123241	2
84022414342	559,537351902767	2
83042710184	541,124713898987	1
84030909364	491,168613869906	2
83112622737	335,444318952178	2
84032327346	327,136622019459	2
83120110543	0	0
83090319863	278,509631871023	2
84122209922	264,852615033528	2
82082803332	249,929181859008	3
83122838520	244,58824043448	1
84052726050	158,038787339021	4
84051408137	28,3004160702855	3
83053031182	0	3
83080321341	0	3
83020207570	0	3
83073015261	0	0
83062845901	0	2

Table 18

The Sequential Parallel method then considers the number of vacancies per entry. If n is the number of vacancies, then the method will assign persons to the trade if they are among the n best ranked persons for the entry and the entry is their first choice. Say for instance that there are 4 vacancies for Entry A and 4 for Entry B in our example in the figure above. For Entry A, the four best ranked applicants would be assigned to the entry while for Entry B, nobody would since the four best ranked persons did not have Entry B as first choice. This would be done for all entries.

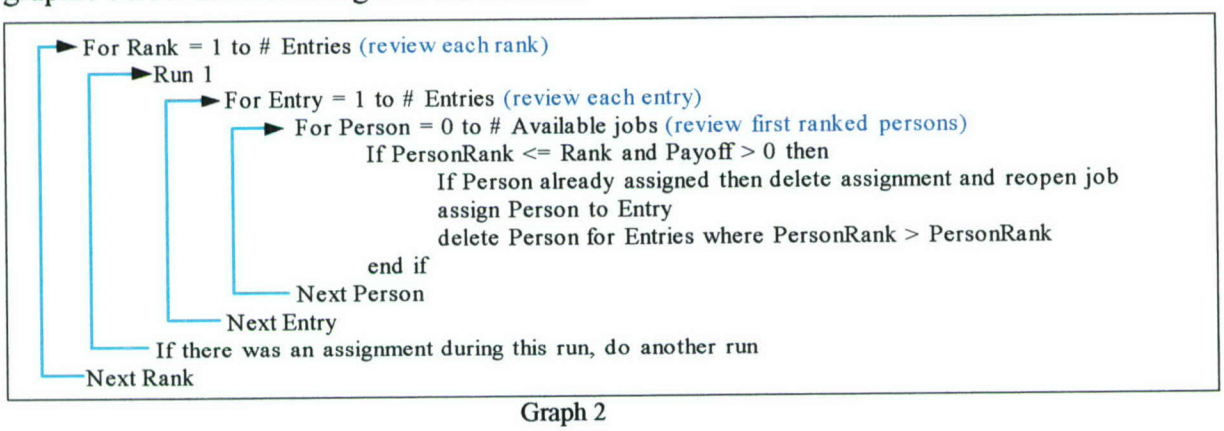
Once a person is assigned to a job, his or her record is deleted in the other tables. In our example for instance, we can see that person with Person-ID 84061018758 (second ranked in Entry A and first in Entry B) is assigned to entry A for this entry is his/her first choice and s/he is among the 4 (because there are 4 vacancies) best ranked for the entry. Keeping his/her record in entry B is then pointless and therefore it can be removed. When considering the 4 (because there are also 4 vacancies for this entry) best-ranked persons for entry B, we now also have to consider the person who was the

5th best ranked for the entry. In the event this entry is his/her first choice (which it isn't in our example), s/he would get entry B.

This procedure is continued as long as persons can be assigned to their first choice.

Then, after adapting the number of vacancies per entry (set to the original number minus the number of persons assigned to the entry in the run considering first choices), the second choice is considered in a similar way. Then the third choice is reviewed and so on.

In this method, it can happen that an applicant is assigned to his/her second choice for instance because at that time s/he doesn't qualify for the entry of his/her first choice. If, during the classification process, due to the deletion of the records of persons who were assigned to an entry of a higher choice, this person's first choice becomes available for him/her, then the person will be assigned to his/her first choice while the vacancy of his/her second choice will be made available again for other persons. The graphic below shows the logic of the method.



Graph 2

The method stops as soon as there are no more vacancies or all choices have been reviewed.

c. Comparison of the two methods

(1) Aims of the two methods

The Sequential Parallel Assignment method (SeqPar) makes sure that the applicants with the highest payoffs get their preferred entry. The main concern of the supporters of this method is that the 'high potentials' are satisfied for they are the future leaders of the organization. To reach that goal, it is acceptable to them that both the aptitude and the preferences of the other persons that will be enlisted are respected less.

For the Psychometric Model (PsyMod), the solution of choice is one that maximizes the aptitudes and preferences of the group of enlisted persons. For the Psychometric Model it is acceptable that an individual does not get the vacancy for which s/he is best qualified or prefers most if that allows reaching a better solution at the group level. The Psychometric Model was developed as a flexible tool allowing the personnel managers to implement their accession policy.

(2) Used parameters

(a) The applicant's aptitude for the entry

Used in both methods. The Sequential Parallel method restricts the used information to metric variables and does not allow categorical information such as the kind of studies applicants took.

(b) The applicant's preferences

Both methods use preferences but in a different way. First, there is a difference in the way the applicant has to express preferences. For the Sequential Parallel method, the preferences are expressed on an ordinal scale (1st choice, 2nd choice, etc.). For the Psychometric Model, a metric scale (from 99 down to 1) is used allowing the applicant to tell the Military how much s/he likes each entry. This was introduced after it was clear that an ordinal scale doesn't give adequate information about the perceived distance between successive ranks. An example from the NCO recruiting will illustrate this point.

Person A		Person B	
Entry	Preference	Entry	Preference
Infantry	99	Navy Radio technician	99
Armor	98	Air Force Electronics	80
Artillery	97		
Transportation	80		

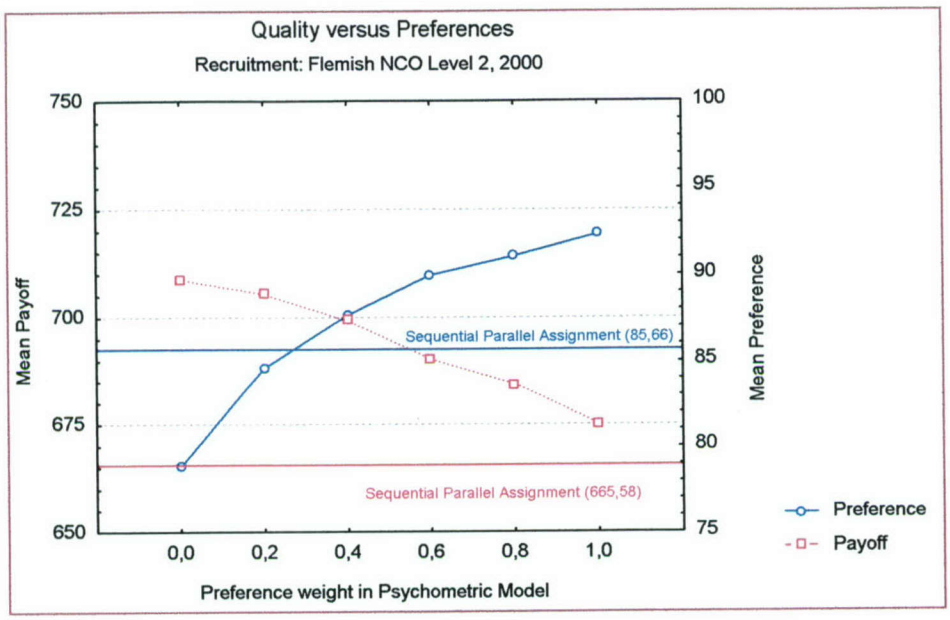
Table 20

In this example, Person A tells us that there is little difference between his three highest choices. Person B on the contrary indicates that to him, there is an important difference between his two choices. He tells us that he wouldn't be very satisfied if he was assigned to his second choice whereas for Person A, it doesn't really matter which of his three first choices he gets (but he wouldn't be happy with the fourth). The Sequential Parallel method only looks at the ranks and therefore has less information. The question at stake is whether Person A wouldn't be more satisfied when he's assigned to his third choice than Person B would be when assigned to his second choice? The Psychometric Model works with the metric preferences and will consequently give precedence to the assignment of Person A to any of his first three choices compared to the assignment of Person B to his second choice.

A second difference related to the applicants' preferences, is the way in which these are processed. The Sequential Parallel method doesn't integrate aptitudes and preferences. The method sorts the applicants for each trade in descending order of their aptitudes and assigns them taking the rank order of their choices into account as was explained earlier. PsyMod integrates aptitudes and preferences for each trade. This originates from the generally accepted idea that the level of performance results from the product of aptitude and motivation. The integrated value of aptitude and preference specifies the utility of assigning a person to a particular job. That is the value that is used by the Psychometric Model in the search of an optimal solution for the classification problem.

A third facet of the topic is that of the importance that is given to the respect of the applicants' preferences. The role that is played by the preferences in

the Sequential Parallel method is fixed. It is known that there is an interaction between the respect of the preferences and the respect of aptitudes. If the recruitment manager wants to maximize aptitudes, there is only little room to respect the applicant's choices. Conversely, if we want to satisfy the applicants, this will most probably happen at the expense of aptitude. This is illustrated by the next graph.



Graph 3

This graph shows for the same recruitment, the average aptitude (left ordinate) and the average preference (right ordinate) for different levels of preference weights in the Psychometric Model. In addition, the graph shows the fixed level of average payoff and average preference yielded by the Sequential Parallel method (horizontal lines).

The graph clearly shows the interaction between aptitude and preference levels. If one wants to maximize the aptitude, this will happen at the expense of the respect of preferences and vice versa. The Sequential Parallel method doesn't allow varying the importance given to the preferences.

Based upon empirical evidence, a usual value given to the preference weight is 0.6. When this value is set for the considered recruitment, you can see that the Psychometric Model performs better both for the respect of preferences and for yielding higher aptitudes.

(c) The importance for the organization of filling vacancies

The Sequential Parallel method offers no possibility to emphasize the importance of filling a particular trade. The psychometric Model does. If there only is a very limited number of applicants qualifying for a more difficult trade, and these applicants also qualify well for other trades that they prefer, the risk is real that the Sequential Parallel method will assign them to their preferred trade and find no suitable applicants for the more difficult trade. If this happens in the Psychometric Model, the user will have the possibility to give a priority to the difficult trade. This will usually result in the assignment of sufficient numbers of qualified applicants to that trade.

(3) The classification algorithm

The Sequential Parallel method follows a rudimentary logic. The method leads to a quasi-mechanical solution of the classification problem and doesn't include any flexibility. The Psychometric Model on the contrary has an impressive number of degrees of freedom when optimizing the payoff matrix. This significantly increases its flexibility to reach good solutions.

(4) Performance

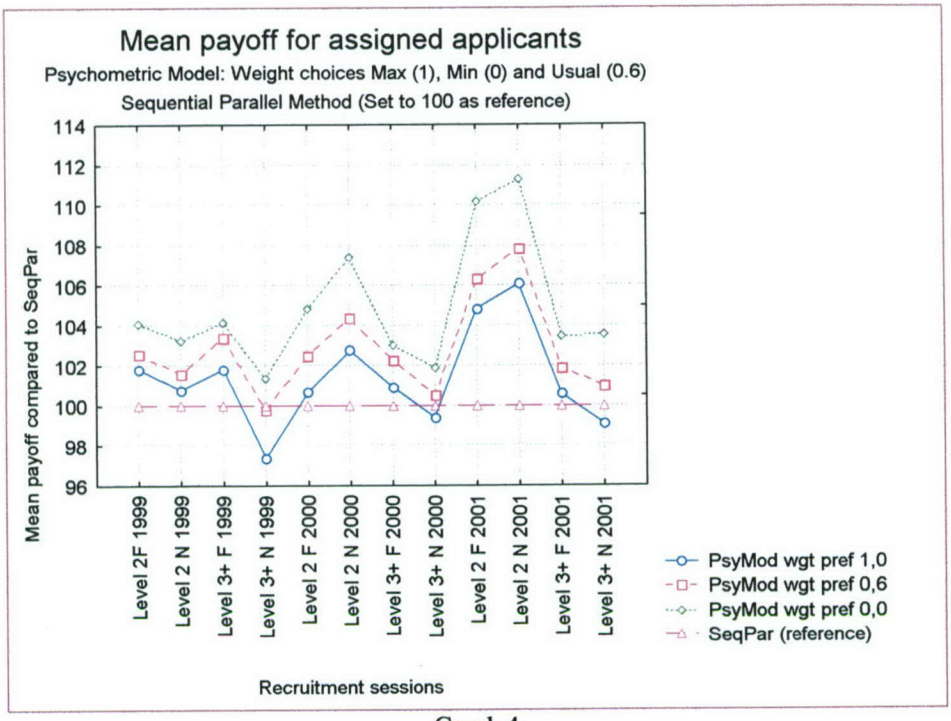
To evaluate the performance level of the two methods, it proves necessary to apply the methods to the same datasets. For that purpose, we used the datasets of the NCO recruitments for the Belgian Defense. We considered the recruitments of 1999, 2000 and 2001. Each year, there are four distinct recruitments. Two are for the French speaking applicants (marked with the letter F) and two for the Flemish applicants (marked with N). For each language group, there are two possibilities: a recruitment for which a high school certificate is required (called Level 2) and another one for younger applicants (called Level 3+). These applicants will have to take the last two year of high school in a military school. The 12 recruitments in this study had 3167 applicants for 983 vacancies[9].

It has to be said that this approach is rather irrelevant for the supporters of the Sequential Parallel method. To them, the mean values of payoffs and preferences of the group that was assigned to a job is not important as long as the best ranked applicants get their preferred job. We do not agree with this point of view and present the results so that the reader can decide for him or herself whether the following comparisons are meaningful.

(a) The aptitude of the applicants who are assigned to a job.

Next graph shows the mean aptitude of the applicants who received a job. Three conditions are given for the Psychometric Model: a maximal weight for the preferences of the applicants (Pref 1,0), the preference weight that actually was used for these recruitments (Pref 0,6) and no weight for the preferences at all (Pref 0,0). For clarity, the mean aptitude yielded by the Sequential Parallel method is set to 100 for the different recruitments as a reference point. The mean aptitudes yielded by the Psychometric Model are given on the same scale.

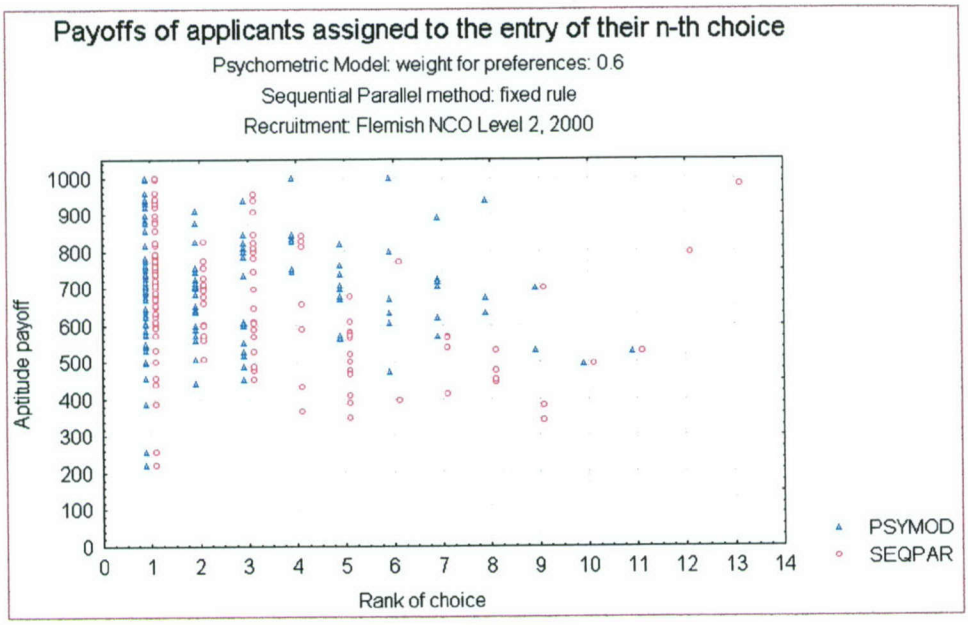
9 As will be described further in the section dealing with the fill rates, the Psychometric Model leads to fewer unfilled vacancies than the Sequential Parallel method. Of course, this has a price. In the search for filling more vacancies, progressively less qualified applicants or applicants with less preference for the job are assigned to jobs. In order to allow a fair comparison in the data presented in graphs 4 and 6, the vacancies that couldn't be filled by the Sequential Parallel Method, were removed from the data.



Graph 4

The graph shows that in most cases, the average aptitude is higher when the assignment is performed with the Psychometric Model. Comparisons in which the Sequential Parallel method can yield better results are these where the Psychometric Model incorporates a (very) high importance of the preferences. Graph 3 illustrated the reason for this.

Next graph makes the transition between the evaluation of aptitudes and preferences. The scatter plot shows the aptitude of assigned applicants for a particular recruitment. The abscissa gives the rank order of the choice expressed by the applicant for the entry s/he was assigned to. Above the abscissa scale value 1 for example, the icons represent the aptitudes of the applicants who were assigned to the entry that was their first choice (blue triangles for the Psychometric Model and red circles for the Sequential Parallel method). For the Psychometric Model, the weight that is given to the preferences of the applicants is the weight that effectively was used in that recruitment.

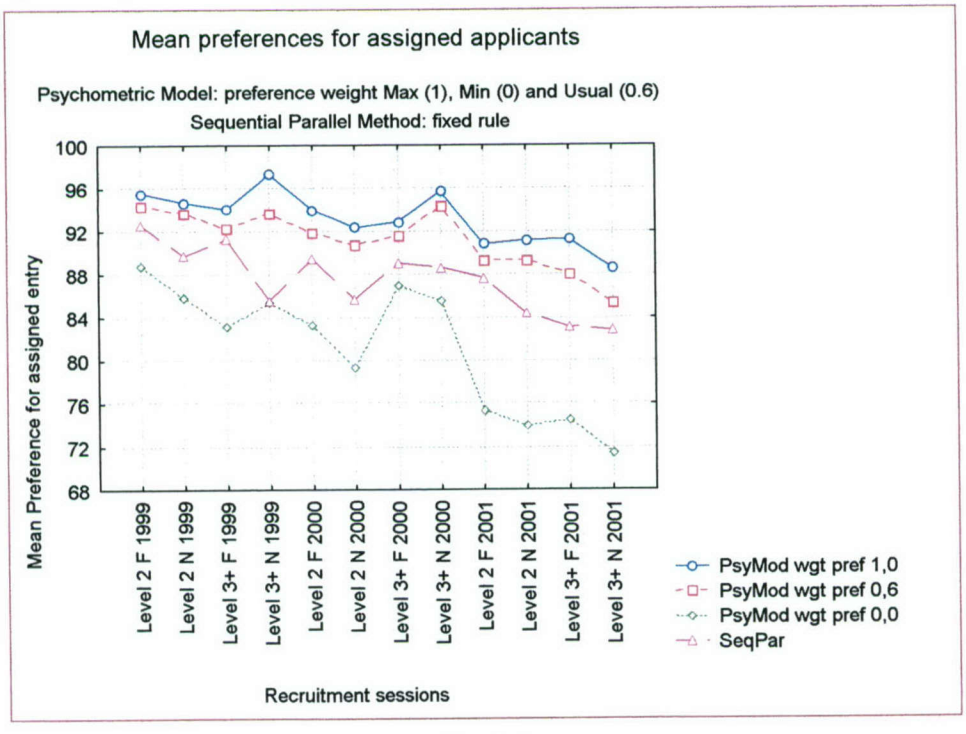


Graph 5

This graph is interesting because it illustrates the fact that, despite what it claims, the Sequential Parallel method doesn't assign the applicants with the highest payoffs to their preferred entry in a much better way than the Psychometric Model does.

(b) Respecting the applicants' preferences

The next graph compares the average preference the applicants expressed for the trade they were assigned to. As explained earlier, with the Psychometric Model, the user can vary the importance given to the expressed preference. The same three conditions are shown as in graph 4.



Graph 6

The average preference obtained by the Sequential Parallel method lays between the boundaries that can be reached by varying the weight given to the preferences in the Psychometric Model. When the weight is set to 0.6 to balance the importance of aptitude versus preference, the Psychometric Model yields better results.

(c) The fill rate

In the twelve analyzed recruiting sessions, nor the Psychometric Model nor the Sequential Parallel method succeeded in filling all vacancies. This was essentially due to unfavorable selection ratios. Some differences were observed and are given in the table below.

	Number of unfilled vacancies	
Recruitment session	Sequential Parallel method	Psychometric Model
NCO Level 2 F 2000	11	10
NCO Level 2 N 2000	2	2
NCO Level 2 F 2001	45	30
NCO Level 2 N 2001	26	2
Total	84	44

Table 21

It isn't surprising that the Sequential Parallel method isn't able to fill as many vacancies as the Psychometric Model does, given their respective methodologies. To the supporters of the Sequential Parallel method, the fill rate isn't even of major concern. The Psychometric Model maximizes the sum of payoffs of assigned applicants. In usual circumstances, this will lead the algorithm to try to assign as many applicants as possible, thus reducing the number of unfilled vacancies. Personnel managers usually open vacancies because the organization needs new personnel. Not filling these vacancies is therefore negative for the organization and should be avoided. A classification method that does not allow incorporating the recruitment priorities of the organization nor tries to maximize the number of assigned persons is therefore less recommendable. For the sake of clarity, it is important to mention that the Psychometric Model results were obtained without the use of priorities. In some cases, the use of priorities allows to further reduce the number of unfilled vacancies.

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ATTACHMENT A: COMPARISON OF AVERAGE PAYOFFS PER TRADE

Comparison of results from the original USAF classification 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

	USAF	PsyMod
Mean payoff:	502,81	701,02

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

	USAF	PsyMod
Mean payoff:	772,82	680,06

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

	USAF	PsyMod
Mean payoff:	802,59	813,95

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

	USAF	PsyMod
Mean payoff:	554,96	674,57

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

	USAF	PsyMod
Mean payoff:	457,49	676,78

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

	USAF	PsyMod
Mean payoff:	319,36	680,06

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

	USAF	PsyMod
Mean payoff:	316,33	679,39

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

	USAF	PsyMod
Mean payoff:	407,10	679,39

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

	USAF	PsyMod
Mean payoff:	370,89	680,06

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

	USAF	PsyMod
Mean payoff:	461,01	706,42

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

	USAF	PsyMod
Mean payoff:	463,78	850,21

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

	USAF	PsyMod
Mean payoff:	498,72	713,97

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

	USAF	PsyMod
Mean payoff:	528,43	885,82

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

	USAF	PsyMod
Mean payoff:	355,22	713,97

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

	USAF	PsyMod
Mean payoff:	533,31	251,81

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

	USAF	PsyMod
Mean payoff:	524,56	767,73

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

	USAF	PsyMod
Mean payoff:	416,56	840,44

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

	USAF	PsyMod
Mean payoff:	461,97	870,72

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

	USAF	PsyMod
Mean payoff:	598,03	

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

	USAF	PsyMod
Mean payoff:	848,01	802,59

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

	USAF	PsyMod
Mean payoff:	496,03	779,89

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

	USAF	PsyMod
Mean payoff:	391,01	677,70

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

	USAF	PsyMod
Mean payoff:	489,22	739,01

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

	USAF	PsyMod
Mean payoff:	525,55	639,10

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

	USAF	PsyMod
Mean payoff:	607,30	639,10

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

	USAF	PsyMod
Mean payoff:	632,28	694,73

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

	USAF	PsyMod
Mean payoff:	405,20	745,82

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

	USAF	PsyMod
Mean payoff:	517,20	693,83

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

	USAF	PsyMod
Mean payoff:	577,81	658,33

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

	USAF	PsyMod
Mean payoff:	595,99	705,09

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

	USAF	PsyMod
Mean payoff:	388,20	544,04

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

	USAF	PsyMod
Mean payoff:	198,58	705,09

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

	USAF	PsyMod
Mean payoff:	457,43	689,05

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

	USAF	PsyMod
Mean payoff:	340,86	704,19

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

	USAF	PsyMod
Mean payoff:	666,35	723,12

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

	USAF	PsyMod
Mean payoff:	551,84	601,19

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

	USAF	PsyMod
Mean payoff:	331,05	595,99

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

	USAF	PsyMod
Mean payoff:	465,08	595,99

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

	USAF	PsyMod
Mean payoff:	500,26	636,07

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

	USAF	PsyMod
Mean payoff:	468,72	619,37

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

	USAF	PsyMod
Mean payoff:	511,84	655,22

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

	USAF	PsyMod
Mean payoff:	498,03	618,26

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

	USAF	PsyMod
Mean payoff:	558,59	543,01

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

	USAF	PsyMod
Mean payoff:	496,03	620,93

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

	USAF	PsyMod
Mean payoff:	439,26	916,13

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

	USAF	PsyMod
Mean payoff:	520,39	811,49

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

	USAF	PsyMod
Mean payoff:	415,75	340,39

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

	USAF	PsyMod
Mean payoff:	343,81	374,64

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

	USAF	PsyMod
Mean payoff:	404,78	592,29

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

	USAF	PsyMod
Mean payoff:	490,81	845,80

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

	USAF	PsyMod
Mean payoff:	464,39	559,63

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

	USAF	PsyMod
Mean payoff:	470,37	831,82

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

	USAF	PsyMod
Mean payoff:	491,67	797,01

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

	USAF	PsyMod
Mean payoff:	751,84	471,31

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

	USAF	PsyMod
Mean payoff:	372,48	603,79

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

	USAF	PsyMod
Mean payoff:	482,32	583,16

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

	USAF	PsyMod
Mean payoff:	271,88	323,26

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

	USAF	PsyMod
Mean payoff:	552,80	643,64

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

	USAF	PsyMod
Mean payoff:	484,68	711,76

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

	USAF	PsyMod
Mean payoff:	452,24	796,11

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

	USAF	PsyMod
Mean payoff:	545,24	779,89

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

	USAF	PsyMod
Mean payoff:	643,64	

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

	USAF	PsyMod
Mean payoff:	530,10	714,28

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

	USAF	PsyMod
Mean payoff:	575,51	

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

	USAF	PsyMod
Mean payoff:	299,88	475,21

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

	USAF	PsyMod
Mean payoff:	367,42	507,68

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

	USAF	PsyMod
Mean payoff:	532,32	476,52

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

	USAF	PsyMod
Mean payoff:	212,18	689,05

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

	USAF	PsyMod
Mean payoff:	403,33	669,25

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

	USAF	PsyMod
Mean payoff:	637,96	813,95

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

	USAF	PsyMod
Mean payoff:	575,51	348,43

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

	USAF	PsyMod
Mean payoff:	459,63	673,92

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

	USAF	PsyMod
Mean payoff:	484,68	757,18

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

	USAF	PsyMod
Mean payoff:	458,49	690,37

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

	USAF	PsyMod
Mean payoff:	273,19	610,34

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

	USAF	PsyMod
Mean payoff:	350,14	615,61

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

	USAF	PsyMod
Mean payoff:	500,75	600,44

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

	USAF	PsyMod
Mean payoff:	285,58	352,13

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

	USAF	PsyMod
Mean payoff:	457,13	593,96

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

	USAF	PsyMod
Mean payoff:	424,56	590,80

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

	USAF	PsyMod
Mean payoff:	572,62	584,31

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

	USAF	PsyMod
Mean payoff:	527,35	468,99

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

	USAF	PsyMod
Mean payoff:	496,79	456,94

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

	USAF	PsyMod
Mean payoff:	360,64	493,60

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

	USAF	PsyMod
Mean payoff:	565,23	449,33

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

	USAF	PsyMod
Mean payoff:	874,27	336,85

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

	USAF	PsyMod
Mean payoff:	579,78	611,36

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

	USAF	PsyMod
Mean payoff:	638,10	901,27

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

	USAF	PsyMod
Mean payoff:	461,54	518,79

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

	USAF	PsyMod
Mean payoff:	556,57	762,65

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

	USAF	PsyMod
Mean payoff:	718,22	770,22

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

	USAF	PsyMod
Mean payoff:	317,95	670,14

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

	USAF	PsyMod
Mean payoff:	487,92	685,81

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

	USAF	PsyMod
Mean payoff:	696,08	331,73

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

	USAF	PsyMod
Mean payoff:	391,33	698,54

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

	USAF	PsyMod
Mean payoff:	359,89	330,46

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

	USAF	PsyMod
Mean payoff:	431,73	326,69

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

	USAF	PsyMod
Mean payoff:	502,48	467,42

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

	USAF	PsyMod
Mean payoff:	414,17	499,89

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

	USAF	PsyMod
Mean payoff:	258,32	512,87

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

	USAF	PsyMod
Mean payoff:	507,59	499,71

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

	USAF	PsyMod
Mean payoff:	650,95	882,94

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

	USAF	PsyMod
Mean payoff:	358,61	231,49

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

	USAF	PsyMod
Mean payoff:	439,63	375,70

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

	USAF	PsyMod
Mean payoff:	521,49	373,40

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

	USAF	PsyMod
Mean payoff:	594,28	367,76

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

	USAF	PsyMod
Mean payoff:	318,99	861,80

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

	USAF	PsyMod
Mean payoff:	477,48	658,95

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

	USAF	PsyMod
Mean payoff:	425,40	596,15

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

	USAF	PsyMod
Mean payoff:	365,20	602,33

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

	USAF	PsyMod
Mean payoff:	740,15	620,93

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

	USAF	PsyMod
Mean payoff:	376,84	702,66

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

	USAF	PsyMod
Mean payoff:	332,25	710,98

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

	USAF	PsyMod
Mean payoff:	410,01	567,13

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

	USAF	PsyMod
Mean payoff:	800,18	603,79

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

	USAF	PsyMod
Mean payoff:	462,38	574,98

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

	USAF	PsyMod
Mean payoff:	302,65	616,88

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

	USAF	PsyMod
Mean payoff:	553,72	693,36

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

	USAF	PsyMod
Mean payoff:	427,67	572,11

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

	USAF	PsyMod
Mean payoff:	464,13	608,15

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

	USAF	PsyMod
Mean payoff:	564,51	643,07

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

	USAF	PsyMod
Mean payoff:	538,32	643,07

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

	USAF	PsyMod
Mean payoff:	893,34	713,97

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

	USAF	PsyMod
Mean payoff:	216,31	710,98

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

	USAF	PsyMod
Mean payoff:	409,57	643,07

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

	USAF	PsyMod
Mean payoff:	547,24	876,42

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

	USAF	PsyMod
Mean payoff:	450,92	791,22

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

	USAF	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

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

ATTACHMENT B: AVERAGE COMPOSITE SCORES PER ENTRY ORIGINAL USAF 1996 ASSIGNMENT

Job-ID (AFSC)	# Assigned	Mechanical	Admin	General	Electronics
1 (1A231)	112	61,06	71,65	73,23	70,84
2 (1A331)	51	67,58	78,94	80,01	81,62
3 (1A431)	57	61,35	73,82	73,98	71,64
4 (1A531)	27	72,77	80,88	85,62	85,33
5 (1C031)	50	35,11	70,12	47,26	49,68
6 (1C032)	195	35,27	69,96	48,08	48,83
7 (1C131)	63	56,68	82,82	74,88	70,38
8 (1C231)	1	65	74	46	42
9 (1C331)	218	44,47	69,78	62,54	59,59
10 (1C431)	48	75,7	70,66	70,81	73,04
11 (1C531)	52	43,3	73,21	70,59	65,21
12 (1N031)	105	57,11	79,59	76,4	72,46
13 (1N131)	87	56,51	78,26	78,09	73,21
14 (1N332A)	11	63	75,63	88,63	84,72
15 (1N334G)	1	19	94	74	65
16 (1N431)	49	60,34	75,75	74,4	70,73
17 (1N531)	45	70,31	75,91	82,88	79,4
18 (1N631)	24	64,2	78,54	76,16	73,58
19 (1T131)	139	45,76	62,27	55,1	55,25
20 (1W031)	290	57,22	76,68	77,49	74,63
21 (2A031A)	66	65,8	67,65	73,31	78,31
22 (2A031B)	72	68,58	77,44	76,7	78,93
23 (2A131)	77	73,94	72,85	77,71	83,87
24 (2A132)	3	88	74,33	83,33	85,33
25 (2A133)	16	75,12	79,5	80,56	81,25
26 (2A134)	7	63,42	74	71,85	80,14
27 (2A137)	91	69,25	70,57	76,05	79,56
28 (2A331A)	114	71,3	72,22	73,57	79,27
29 (2A331B)	156	70,71	76,62	76,2	80,42
30 (2A331C)	126	65,92	76,38	73,38	77,58
31 (2A332A)	162	70,1	71,27	74,79	79,91
32 (2A332B)	100	72,03	72,59	73,34	79,55
33 (2A332C)	81	72,16	70,48	73,76	78,75
34 (2A333A)	354	73,74	63,58	64,78	68,82
35 (2A333B)	317	72,35	67,36	64,14	68,49
36 (2A333C)	17	79	61,58	66,64	72,23
37 (2A333E)	80	70,55	64,31	61,63	68,37
38 (2A333H)	32	71,93	63,06	64,25	71,21
39 (2A431)	121	70,34	75,43	77,71	80,88
40 (2A432)	126	68,42	75,11	74,53	79,47
41 (2A433)	81	69,3	74,53	78,69	82,32
42 (2A531A)	209	71,12	63,66	63,7	67,42
43 (2A531B)	80	71,5	62,48	60,37	64,33
44 (2A531C)	306	72,94	63,81	63,1	67,27
45 (2A531D)	101	73,01	64,97	62,64	65,95
46 (2A531E)	121	71,76	67,66	65	68,7
47 (2A531F)	83	72,28	62,69	59,38	65,72
48 (2A531G)	166	70,42	62,93	62,82	67,23
49 (2A531H)	116	71,52	60,64	60,75	66,12
50 (2A532)	17	79,29	65,11	65	70,88
51 (2A533A)	42	68,66	71,97	74,11	79,04
52 (2A533B)	45	70	74,66	80,73	80,68
53 (2A533C)	18	67,16	67,94	71,55	77,05
54 (2A631B)	85	72,61	59,55	61,57	66,75
55 (2A631D)	96	62,2	61,8	57,16	59,09
56 (2A631E)	89	64,32	59,47	56,31	61,12
57 (2A632)	194	72,73	65,36	63,98	68,62
58 (2A633)	92	70,76	61,95	59,77	63,44
59 (2A634)	218	67,16	61,79	58,93	62
60 (2A635)	294	72,96	65,18	62,5	67,29
61 (2A636)	228	70,12	68,36	70,83	75,97
62 (2A731)	37	74,62	63,29	58,16	65,7
63 (2A732)	105	40,86	67,22	59,02	57,2
64 (2A733)	364	69,5	61,77	61,16	65,35
65 (2A734)	71	57,45	60,39	51,42	54,97

Job-ID (AFSC)	# Assigned	Mechanical	Admin	General	Electronics
66 (2E031)	38	63,57	76,26	74,26	78,47
67 (2E131)	128	72,25	75,57	78,65	82,6
68 (2E132)	20	73,8	76,65	77,9	82,45
69 (2E133)	97	70,42	74,54	75,69	80,55
70 (2E134)	25	60,04	76,48	71,8	79,2
71 (2E231)	81	68,28	73,29	76,3	79,3
72 (2E231B)	18	76,27	77,5	87,11	86
73 (2E331)	225	68,38	72,15	74,59	79,91
74 (2E431)	16	72,06	71,87	77,68	80,62
75 (2E631)	86	67,12	61,13	55,5	59,15
76 (2E632)	125	69,72	64,38	60,32	63,25
77 (2E633)	377	57,01	66,15	63,84	67,76
78 (2E831)	29	71,41	76,89	77,55	81,48
79 (2F031)	456	68,65	63,6	60,7	63,5
80 (2M031A)	108	71,19	73,33	76,79	80,82
81 (2M031B)	74	71,58	74,68	76,71	81,41
82 (2M032A)	121	70,66	66,18	63,57	67,38
83 (2M033A)	62	55,16	67,69	64,74	69,72
84 (2P031)	67	71,7	74,94	77,1	81,37
85 (2R031)	45	49,33	76,46	69,93	65,59
86 (2R131)	93	39,09	65,56	56,91	53,27
87 (2S031)	932	36,87	68,47	47,82	49,41
88 (2T031)	172	37,85	68,41	49,92	51,13
89 (2T131)	99	59,76	58,25	54,91	57,14
90 (2T231)	303	68,56	65,32	60,78	64,6
91 (2T331)	31	74,12	61,74	63,54	65,03
92 (2T332A)	24	66,91	53,66	55,83	56,25
93 (2T332B)	17	60,47	46,64	55,17	56,05
94 (2T431)	124	70,86	53,53	55,95	63,78
95 (2W031)	778	67,16	67,49	66,54	67,44
96 (2W131C)	146	62,98	66,82	61,07	64,82
97 (2W131E)	287	62,25	64,71	60,22	64,69
98 (2W131F)	344	61,7	64,88	61,2	65,32
99 (2W131K)	13	72,46	66,23	64,76	66,23
100 (2W131L)	12	60,5	67,75	61,83	66,75
101 (2W131Z)	14	65,78	67,42	68,64	72,21
102 (2W231)	146	76,49	66,56	66,26	72,03
103 (3A031)	909	32,7	68,1	47,37	47,21
104 (3C031)	402	57,07	74,88	76,49	72,53
105 (3C032)	213	78,52	84,84	92,2	90,97
106 (3C131)	50	34,32	77,2	46,54	48,14
107 (3C231)	164	66,76	75,68	75,19	78,93
108 (3C331)	29	50,2	74,75	71,2	65,55
109 (3E031)	173	54,57	62,34	58,5	63,61
110 (3E032)	176	74,35	64,65	65,44	71,91
111 (3E131)	180	57,96	60,16	55,66	59,65
112 (3E231)	119	66,43	56,89	58,47	62,56
113 (3E331)	83	71,54	64,48	63,65	67,71
114 (3E431)	159	69,32	64,11	62,83	65,32
115 (3E432)	33	67,6	62,69	60,27	65,63
116 (3E433)	18	46,16	58,88	56,88	60,05
117 (3E731)	612	57,41	67,49	63,89	62,35
118 (3E831)	140	80,3	74,42	81,07	82,19
119 (3M031)	438	37,24	60,01	52,08	50,84
120 (3P031)	2382	50,35	65,86	58,93	58,6
121 (3P032)	769	55,4	66,4	62,85	62,48
122 (3P032A)	60	62,83	71,34	68,26	67,53
123 (3P131)	43	76,55	66,88	62,76	67,16
124 (3S031)	499	35,66	73,83	50,25	49,88
125 (4A031)	523	39,52	70,43	60,01	56,36
126 (4A131)	160	42,65	70,57	58,14	54,12
127 (4A231)	104	68,01	77,67	80,06	82,81
128 (4B031)	95	51,54	75,66	69,04	66,86
129 (4C031)	91	45,14	74,21	70,76	64,69
130 (4D031)	149	42,59	65,46	60,09	57,94
131 (4E031)	40	43,77	71,52	65,77	62,6
132 (4F031)	57	45,64	74,1	65,71	60,47
133 (4H031)	61	52,67	75,93	70,52	70,98
134 (4J032)	32	54,56	77,06	74,12	68,9
135 (4M031)	6	43,83	76,83	70,33	60
136 (4N031)	800	46,82	72,81	63,51	61,34

Job-ID (AFSC)	# Assigned	Mechanical	Admin	General	Electronics
137 (4N131)	138	47,95	70,34	64,55	61,86
138 (4P031)	63	45,36	75,49	65,53	63,69
139 (4R031)	59	52,25	77,33	65,76	64,3
140 (4T031)	31	51,51	84,61	77,48	71,83
141 (4T032)	10	67,2	88,8	87	78,9
142 (4V031)	27	43,96	71,66	67	61,4
143 (4Y031)	204	39,32	68,76	57,74	56,01
144 (6C031)	66	57,36	81,21	82,37	76,36
145 (6F031)	205	47,51	75,64	71,74	65,99
146 (6F032)	272	48,77	75,11	72,1	66,13
Total	23578				

ATTACHMENT C: ANALYSIS OF COMPOSITE AVERAGES FOR DIFFERENT TRADES (ORIGINAL USAF 1996 ASSIGNMENT - PSYCHOMETRIC MODEL) (DATA: USAF 1996 (ASSIGNED PER K))

Job-ID	Rule	Composite	Minimum	USAF	Assignment	PsyMod	Assignment	Difference
				# Assigned	Average	# Assigned	Average	
1A231	NA	General	55	112	73,23	112	88,28	+15,04
1A331	NA	Electronics	67	51	81,62	51	95,03	+13,4
1A431	NA	General	53	57	73,98	57	85,71	+11,72
1A531	NA	Electronics	67	27	85,33	27	95,92	+10,59
1C031	NA	Admin	45	50	70,12	50	87,3	+17,17
1C032	NA	Admin	45	195	69,96	195	87,79	+17,83
1C131	NA	General	53	63	74,88	63	85,49	+10,61
1C231	NA	General	43	1	46	1	80	+34
1C331	NA	General	48	218	62,54	218	82,93	+20,39
1C431	NA	General	48	48	70,81	48	82,79	+11,98
1C531	NA	General	53	52	70,59	52	85,69	+15,09
1N031	NA	General	55	105	76,4	105	88,17	+11,76
1N131	NA	General	64	87	78,09	87	97,75	+19,65
1N332A	NA	General	69	11	88,63	11	98,81	+10,18
1N334G	NA	General	69	1	74	1	99	+25
1N431	NA	General	58	49	74,4	49	89,83	+15,42
1N531	NA	General	69	45	82,88	45	98,84	+15,96
1N631	NA	General	58	24	76,16	24	90,08	+13,92
1T131	NA	General	30	139	55,1	139	40,33	-14,78
1W031	AND	General	64	290	77,49	290	91,79	+14,3
1W031	AND	Electronics	50	290	74,63	290	89,66	+15,03
2A031A	NA	Electronics	67	66	78,31	66	95,48	+17,17
2A031B	NA	Electronics	67	72	78,93	72	94,08	+15,14
2A131	NA	Electronics	72	77	83,87	8	99	+15,12
2A132	NA	Electronics	67	3	85,33	3	92,66	+7,32
2A133	NA	Electronics	67	16	81,25	16	92,75	+11,5
2A134	NA	Electronics	67	7	80,14	7	91,85	+11,7
2A137	NA	Electronics	67	91	79,56	91	92,09	+12,53
2A331A	NA	Electronics	67	114	79,27	114	90,11	+10,84
2A331B	NA	Electronics	67	156	80,42	156	89,47	+9,04
2A331C	NA	Electronics	67	126	77,58	126	87,38	+9,79
2A332A	NA	Electronics	67	162	79,91	162	88,15	+8,24
2A332B	NA	Electronics	67	100	79,55	100	87,96	+8,4
2A332C	NA	Electronics	67	81	78,75	81	85,86	+7,11
2A333A	NA	Mechanical	51	354	73,74	354	80,28	+6,54
2A333B	NA	Mechanical	51	317	72,35	317	81,7	+9,35
2A333C	NA	Mechanical	51	17	79	17	82,05	+3,04
2A333E	NA	Mechanical	51	80	70,55	80	80,8	+10,25
2A333H	NA	Mechanical	51	32	71,93	32	81,31	+9,37
2A431	NA	Electronics	67	121	80,88	121	87,03	+6,15
2A432	NA	Electronics	67	126	79,47	126	87,89	+8,42
2A433	NA	Electronics	67	81	82,32	80	87,98	+5,66
2A531A	NA	Mechanical	51	209	71,12	209	79,18	+8,06
2A531B	NA	Mechanical	51	80	71,5	80	79,22	+7,71
2A531C	NA	Mechanical	51	306	72,94	306	78,21	+5,26
2A531D	NA	Mechanical	51	101	73,01	101	77,94	+4,92
2A531E	NA	Mechanical	51	121	71,76	121	78,51	+6,75
2A531F	NA	Mechanical	51	83	72,28	83	77,04	+4,76
2A531G	NA	Mechanical	51	166	70,42	166	76,93	+6,51
2A531H	NA	Mechanical	51	116	71,52	116	77,45	+5,93
2A532	NA	Mechanical	57	17	79,29	17	92,35	+13,05
2A533A	NA	Electronics	67	42	79,04	41	87,09	+8,04
2A533B	NA	Electronics	67	45	80,68	45	87,46	+6,77
2A533C	NA	Electronics	67	18	77,05	18	87,88	+10,82
2A631B	NA	Mechanical	57	85	72,61	85	92,42	+19,81
2A631D	NA	Mechanical	44	96	62,2	96	57,44	-4,77
2A631E	NA	Mechanical	44	89	64,32	89	57,55	-6,77
2A632	AND	Mechanical	51	194	72,73	194	76,24	+3,5
2A632	AND	Electronics	33	194	68,62	194	78,44	+9,81
2A633	NA	Mechanical	57	92	70,76	92	93,02	+22,25
2A634	NA	Mechanical	51	218	67,16	218	76,77	+9,61
2A635	NA	Mechanical	57	294	72,96	294	92,69	+19,73
2A636	AND	Mechanical	45	228	70,12	228	92,41	+22,28
2A636	AND	Electronics	60	228	75,97	228	89,94	+13,97

Job-ID	Rule	Composite	Minimum	USAF	Assignment	PsyMod	Assignment	Difference
				# Assigned	Average	# Assigned	Average	
2A731	NA	Mechanical	51	37	74,62	37	75,83	+1,2
2A732	NA	General	43	105	59,02	105	75,48	+16,46
2A733	NA	Mechanical	51	364	69,5	364	75,14	+5,64
2A734	NA	Mechanical	44	71	57,45	71	57,61	+0,15
2E031	NA	Electronics	67	38	78,47	38	86,71	+8,23
2E131	NA	Electronics	67	128	82,6	124	88,49	+5,89
2E132	NA	Electronics	67	20	82,45	19	85,89	+3,43
2E133	NA	Electronics	67	97	80,55	93	87,18	+6,63
2E134	NA	Electronics	67	25	79,2	25	88,36	+9,15
2E231	NA	Electronics	67	81	79,3	79	87,6	+8,29
2E231B	NA	Electronics	67	18	86	16	87,18	+1,18
2E331	NA	Electronics	67	225	79,91	220	86,45	+6,54
2E431	NA	Electronics	67	16	80,62	14	87,57	+6,94
2E631	NA	Mechanical	51	86	67,12	86	75,43	+8,31
2E632	NA	Mechanical	51	125	69,72	125	73,9	+4,18
2E633	NA	Electronics	46	377	67,76	377	65,72	-2,05
2E831	NA	Electronics	67	29	81,48	29	86,51	+5,03
2F031	AND	Mechanical	51	456	68,65	456	81,77	+13,11
2F031	AND	General	39	456	60,7	456	82,02	+21,31
2M031A	NA	Electronics	67	108	80,82	104	85,51	+4,69
2M031B	NA	Electronics	67	74	81,41	71	83,11	+1,7
2M032A	NA	Mechanical	51	121	70,66	121	74,21	+3,54
2M033A	NA	Electronics	50	62	69,72	62	71,85	+2,12
2P031	NA	Electronics	67	67	81,37	64	86,93	+5,56
2R031	NA	General	53	45	69,93	45	85,64	+15,7
2R131	NA	General	43	93	56,91	93	75,5	+18,59
2S031	OR	Admin	45	932	68,47	932	88,02	+19,54
2S031	OR	General	43	932	47,82	932	63,68	+15,86
2T031	NA	Admin	40	172	68,41	172	81,87	+13,46
2T131	NA	Mechanical	44	99	59,76	99	57,74	-2,02
2T231	AND	Mechanical	51	303	68,56	303	68,29	-0,27
2T231	AND	Admin	32	303	65,32	303	89,02	+23,7
2T331	NA	Mechanical	51	31	74,12	31	73,83	-0,3
2T332A	NA	Mechanical	44	24	66,91	24	57,54	-9,37
2T332B	NA	Mechanical	44	17	60,47	17	57,58	-2,9
2T431	NA	Mechanical	51	124	70,86	124	74,2	+3,34
2W031	OR	Mechanical	61	778	67,16	778	59,57	-7,59
2W031	OR	Electronics	46	778	67,44	778	63,95	-3,49
2W131C	OR	Mechanical	61	146	62,98	146	59,9	-3,08
2W131C	OR	Electronics	46	146	64,82	146	64,21	-0,61
2W131E	OR	Mechanical	61	287	62,25	287	59,07	-3,18
2W131E	OR	Electronics	46	287	64,69	287	63,29	-1,4
2W131F	OR	Mechanical	61	344	61,7	344	58,29	-3,42
2W131F	OR	Electronics	46	344	65,32	344	62,92	-2,4
2W131K	OR	Mechanical	61	13	72,46	13	58,84	-13,62
2W131K	OR	Electronics	46	13	66,23	13	63	-3,24
2W131L	OR	Mechanical	61	12	60,5	12	56,25	-4,25
2W131L	OR	Electronics	46	12	66,75	12	62,16	-4,6
2W131Z	OR	Mechanical	61	14	65,78	14	55	-10,78
2W131Z	OR	Electronics	46	14	72,21	14	61,92	-10,29
2W231	NA	Mechanical	61	146	76,49	146	97,46	+20,97
3A031	NA	Admin	32	909	68,1	909	74,41	+6,31
3C031	NA	General	60	402	76,49	402	94,17	+17,68
3C032	NA	General	60	213	92,2	213	93,3	+1,09
3C131	NA	Admin	45	50	77,2	50	87,04	+9,84
3C231	NA	Electronics	67	164	78,93	148	84,95	+6,01
3C331	NA	General	58	29	71,2	29	90,41	+19,2
3E031	NA	Electronics	33	173	63,61	173	54,83	-8,79
3E032	AND	Mechanical	57	176	74,35	176	83,78	+9,43
3E032	AND	Electronics	43	176	71,91	176	83,84	+11,93
3E131	OR	Mechanical	51	180	57,96	180	41,43	-16,53
3E131	OR	Electronics	33	180	59,65	180	47,98	-11,68
3E231	NA	Mechanical	44	119	66,43	119	58,23	-8,21
3E331	NA	Mechanical	51	83	71,54	83	74,91	+3,36
3E431	NA	Mechanical	51	159	69,32	159	73,51	+4,19
3E432	NA	Mechanical	51	33	67,6	33	74,27	+6,67
3E433	NA	General	39	18	56,88	18	65,11	+8,22
3E731	NA	General	39	612	63,89	612	65,54	+1,65
3E831	AND	Mechanical	61	140	80,3	140	94,88	+14,57
3E831	AND	General	60	140	81,07	140	96	+14,93

Job-ID	Rule	Composite	Minimum	USAF	Assignment	PsyMod	Assignment	Difference
				# Assigned	Average	# Assigned	Average	
3M031	NA	General	30	438	52,08	438	40,98	-11,11
3P031	NA 2	General	35	2382	58,93	2382	54,01	-4,93
3P032	NA	General	35	769	62,85	769	54,57	-8,29
3P032A	NA	General	35	60	68,26	60	52,86	-15,41
3P131	NA	Mechanical	61	43	76,55	43	96,39	+19,84
3S031	NA	Admin	45	499	73,83	499	87,21	+13,37
4A031	NA	General	43	523	60,01	523	74,45	+14,44
4A131	NA	General	43	160	58,14	160	73,73	+15,59
4A231	NA	Electronics	67	104	82,81	95	85,65	+2,84
4B031	NA	General	48	95	69,04	95	83,22	+14,17
4C031	NA	General	53	91	70,76	91	86,35	+15,58
4D031	NA	General	43	149	60,09	149	72,55	+12,45
4E031	NA	General	43	40	65,77	40	72,09	+6,32
4F031	NA	General	43	57	65,71	57	72,91	+7,2
4H031	NA	General	43	61	70,52	61	72,06	+1,54
4J032	NA	General	48	32	74,12	32	83,93	+9,81
4M031	NA	General	43	6	70,33	6	71	+0,67
4N031	NA	General	43	800	63,51	800	73,91	+10,39
4N131	NA	General	43	138	64,55	138	76,3	+11,75
4P031	NA	General	43	63	65,53	63	75,17	+9,64
4R031	NA	General	43	59	65,76	59	75,28	+9,51
4T031	NA	General	58	31	77,48	31	90,45	+12,97
4T032	NA	General	43	10	87	10	74,8	-12,21
4V031	NA	General	53	27	67	27	86,07	+19,06
4Y031	NA	General	43	204	57,74	204	76,55	+18,8
6C031	NA	General	70	66	82,37	66	98,78	+16,4
6F031	NA	Admin	55	205	75,64	205	95,33	+19,68
6F032	NA	Admin	55	272	75,11	272	95,07	+19,95