Motivated or Motivating? What sort of tester are you?

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Abstract

The results of a motivation survey of over 600 testers are presented. Two main areas are covered: the relevance of generic motivation theories to software testers and practical guidance on motivating testers based on evidence from the survey. Results of measuring testers' motivation in terms of the Job Characteristics Model and Pink's Motivation 3.0 are presented, and new combined models with stronger prediction accuracy are suggested. Specific results showing how different factors affect different subsets of testers are provided.

Introduction

This paper provides an overview of the findings from a large survey into the motivation of software testers (over 600) over a two year period. There were two main objectives of the study. The first was to investigate the relevance of generic motivation theories to the day-to-day practices of software testing, while the second was to analyse the results to identify those motivating and demotivating factors most important to testers today.

Motivation is one of the most well-studied areas of management, and new theories are proposed on a regular basis. Despite this, many managers of software testers appear to favour the traditional 'carrot and stick' approach even when there is ever growing evidence that this approach is ineffective. More enlightened managers recognize that other approaches are available, but may find the diversity of motivation theories overwhelming and may wonder whether they apply to those working in software testing today.

Background

This study has concentrated on three motivation theories spread across 50 years: Herzberg's 1959 Motivation-Hygiene Theory [8], Hackman and Oldham's 1974 Job Characteristics Model [7] and Daniel Pink's 2010 Motivation 3.0 [10]. There are obviously many other motivation theories and some have been applied to software development and testing - for an overview of how motivation has been applied to software engineering see [11].

Herzberg's Motivation-Hygiene Theory - This theory states that those factors that motivate an individual are different from those factors that demotivate them. Thus to achieve motivation, it argues that it is not simply necessary to remove the demotivators, but it is also necessary to introduce or reinforce a different set of motivators.

This theory was based on interviews and many researchers have found it difficult to replicate the original results, possibly due to the data collection approach. Later experiments moved to the analysis of free-form questionnaire responses and most people quoting the theory today tend to use a 'softer' version: 'those factors that motivate an individual are not necessarily the same as those factors that demotivate them'.

Hackman and Oldham's Job Characteristics Model (JCM) - This theory is based on the idea that individuals need to achieve three critical psychological states to be motivated: 'Meaningfulness of work', 'Outcome responsibility' and 'Knowledge of the final results'. Five core job characteristics are used to determine these states:

- Skill Variety (V) (the range of different skills used)
- Task Identity (I) (the degree of completing a whole job)
- Task Significance (S) (the importance of the job)
- Autonomy (A) (the level of control of your own time)
- Feedback (F) (the degree of supervisory & results-based feedback)

$$MPS = \frac{(V + I + S)}{3} * A * F$$

These five characteristics can then be combined to calculate the 'Motivating Potential Score' (MPS) for a job, with the aim of providing guidance on how the job can be (re-)designed to provide greater motivation (and satisfaction) to the employee and productivity for the employer. The (partial) rationale for the formula is that the 'Meaningfulness of work' psychological state can be achieved by attaining a high score for at least one of variety, identity and significance, and a high score must also be achieved for both autonomy and feedback to achieve the other two psychological states.

The JCM has proved very popular with researchers and as early as 1987 a meta-analysis of nearly 200 individual studies was performed [5]. This concluded that the use of multiple job characteristics to predict motivation was supported, but that there was less agreement on whether the JCM's five factor approach was optimal, with a number of studies suggesting that fewer factors could be used. Another question that arose from the meta-analysis was whether a simple additive formula for MPS would be a better predictor than the original multiplicative formula.

A number of studies have applied JCM to the IT industry, many comparing motivation across countries, and a typical assumption in these studies is that those working in the software industry are 'special' (typically higher skilled) and so require jobs with a higher MPS. In 1980 an enhancement to the model was suggested by Couger and Zawacki [3] and used in a number of studies to take account of the unique attributes of data processing and those working in it. One study [13] specifically differentiated between software testers and others working in the IT industry. This study of 255 IT professionals included 31 testers and found that their average MPS score was the lowest of the 5 IT disciplines studied.

Daniel Pink's Motivation 3.0 – This motivation model is outlined in his book, Drive: The Surprising Truth About What Motivates Us [10], and it suggests motivation is based on three major factors: autonomy, mastery (constantly challenging yourself to improve) and purpose (doing something for the good of others).

Motivation 3.0 is reportedly based on evidence from 40 years of scientific research and is presented as an evolution from the Motivation 2.0 carrot and stick model, which in turn replaced the simple motivation to survive (Motivation 1.0). He suggests (and provides evidence) that whereas with simple repetitive tasks it is possible to motivate using extrinsic motivators, such as salary, those performing today's more complex jobs, such as in IT, can actually be made less motivated and in turn less productive if promised bonuses on completion. He goes on to suggest that for innovative tasks requiring more skills, intrinsic motivators such as the need to challenge oneself have been shown to be more effective.

The Survey

The data in this survey was gathered through a forty-question questionnaire that was available both online and on paper. The questions covered demographics (e.g. number of years in testing, industry sector), motivation characteristics using a five-point Likert scale (based on the Job Diagnostic Survey of JCM) and motivation/demotivation using open-ended questions. The motivation characteristics questions are shown in Annex A.

By August 2013, after two years, over 600 responses had been gathered. The motivation characteristics questions were balanced between those asked positively and those asked negatively in an effort to reduce response bias [9]. For some characteristics several questions were used to cover different aspects and this allowed consistency of responses by an individual to be measured. A number of responses were incomplete and some responses were inconsistent (e.g. every answer was 'strongly disagree') and these were removed from further analysis, leaving 545 complete responses (>21,800 data points).

Demographics

The following demographic information was collected, along with the number of years of experience working in testing, organization size, salary, and qualifications.

Region – The majority of respondents were from Australia (45%) and Europe (42%), with 6% and 5% from Asia and The Americas, respectively.

Sector – A wide range of industry sectors were represented with Finance and Insurance represented by 22% of respondents, IT by 21%, Retail/Wholesale by 9%, Government by 8%, Healthcare by 6%, Services by 5% and Communications by 4%.

Organization type – The largest number of respondents (37%) worked in an IT Department, while the next highest (28%) worked in an IT Organization. Testing Services employed 19%, while self-employed consultants and contractors accounted for about 3% each.

Life Cycles – The largest group (41%) were using linear (V-Model/Waterfall) life cycle models, while the next largest (28%) were following an agile approach. Iterative (e.g. RUP, not agile) life cycles were being used by 10%, while 7% were working on maintenance.

Roles – Testers performing in a wide range of roles completed the questionnaire. In descending order the most popular were: Test Analyst (25%), Test Manager (25%), Test Lead (13%), Test Consultant (9%), Head of Testing (7%) and Developer/Tester (5%).

Evaluation of Results

A core focus of the study was to determine whether different motivation models provide a valid means of predicting intrinsic motivation for testers. The intrinsic motivation was measured using question 19 in Annex A, which specifically considers how respondents perceived their own level of motivation. The validity of the models (or parts of models) at predicting this perceived level of motivation was determined by measuring the Pearson's Product-Moment correlation coefficient between the scores produced by the different models and the declared perceived level of motivation from respondents in question 19. This provides a measure of how strongly the score correlates with (i.e. can predict) the perceived motivation on a scale of -1 to +1, where a positive score indicates a positive relationship. Scores below 0.2 indicates a negligible relationship, while scores above 0.4 indicate a strong relationship. Where correlation results are provided for the complete set of 545 respondents the statistical significance exceeds a confidence level of 99% ($p<0.01$). In the section on 'Smarter Motivation' analysis has been performed on subsets of the whole dataset and specific confidence levels are provided where appropriate.

The perceived levels of motivation for the respondents are shown in the chart on the left in figure 1 – these are the results of question 19 in Annex A. The chart on the right shows the corresponding figures for US Government employees in 2010 answering the question "I feel highly motivated in my work" for a similar study [12]. As can be seen, the two groups show comparable patterns of perceived motivation.

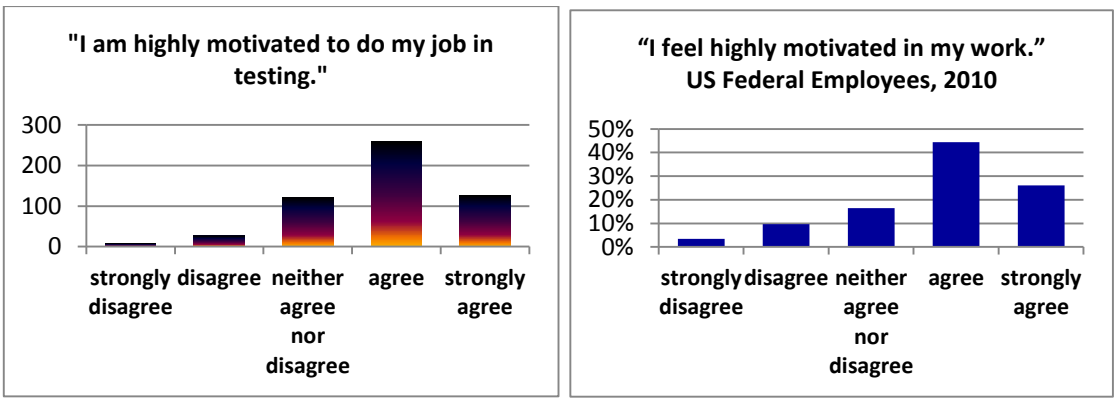

Figure 1: Perceived Motivation

Results & Analysis

Motivating Potential Score (MPS) and Characteristics

The average MPS from all 545 respondents was 106, with a minimum of 12 and a maximum of 306. The MIP Report [13] questioned whether a job with an MPS below 60 could "keep the simplest human being occupied",

however 16% of respondents appear to fall into that category, and it is perhaps unsurprising that more than half of these are test analysts. The same report questioned whether a job with a MPS greater than 240 could "possibly be done by any one person" – of the five scores in this range four were for Heads of Testing, and one for a Test Manager.

The JCM characteristics scores were determined from combining the scores from each of the relevant questions in the survey (Annex A shows the questions for each individual factor). For instance, the Feedback characteristic relates to feedback from colleagues, supervisors and the work itself and so three questions are used to determine the overall Feedback score. Figure 2 shows the correlation for each of the *individual* factors represented by these questions with the perceived level of motivation (question 19). As can be seen every single factor has a positive correlation, although for many it is very low. This indicates that using these factors in isolation is not usually practicable and they are subsequently combined into the five JCM characteristics, which are shown in figure 3. Note that Variety 2 ("In my job I get the chance to work on many interesting projects") has a comparatively high correlation of 0.39 on its own.

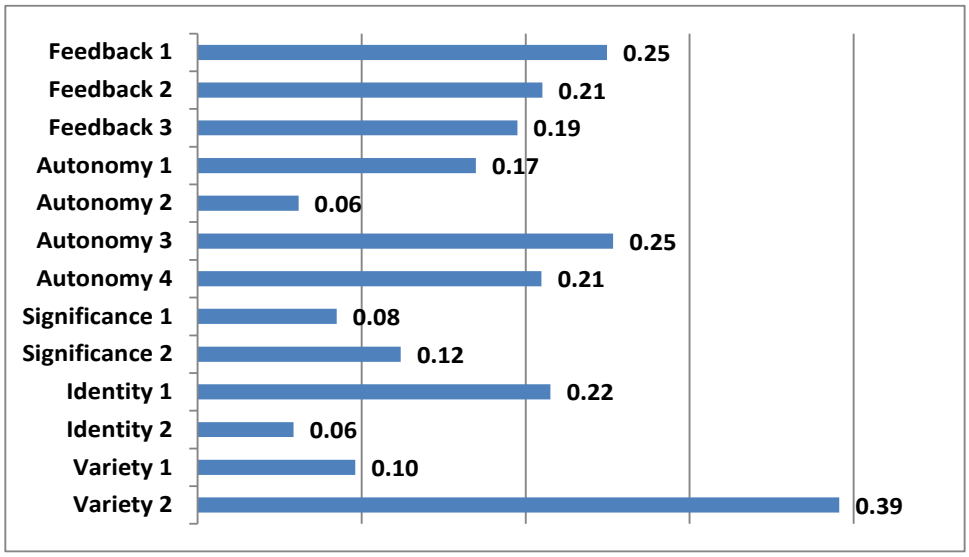

Figure 2: MPS Factors correlation with Perceived Motivation

As can be seen from figure 3, when the factors are combined to create the JCM characteristics the correlation is not the average of the factors. We can see that task significance and task identity appear to be less important to the motivation of testers than the other three characteristics. According to the theory behind JCM this is valid – only one of significance, identity and variety needs to be high for a job to end up with a high motivating potential score (MPS). This suggests that to testers in general the critical psychological state of: 'Meaningfulness of work' is largely satisfied by the variety of the work rather than them believing that their role is important or that they are completing end-to-end tasks.

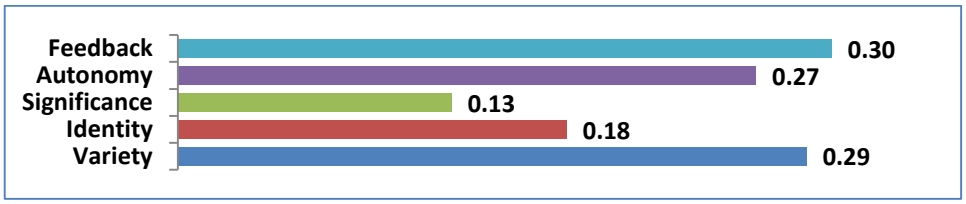

Figure 3: MPS Characteristics correlation with Perceived Motivation

Motivation 3.0 Factors

Daniel Pink suggests that people today performing non-trivial tasks are motivated by mastery, autonomy and purpose. The correlations for each of the individual factors represented by these three characteristics are shown in figure 4 – again, each of these questions can be seen in Annex A.

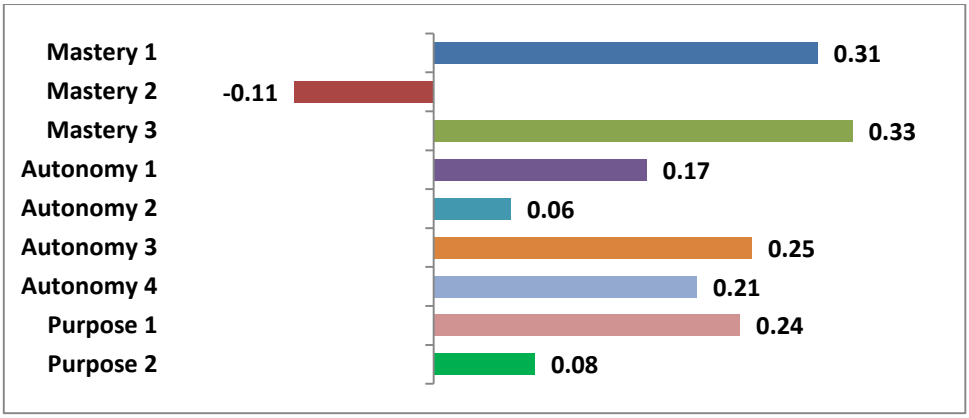

Figure 4: Motivation 3.0 Factors correlation with Perceived Motivation

It is immediately apparent that there is an unexpected result for 'Mastery 2'. This was a negative question - "I have mastered most of the skills required to perform my job". One of the ideas underlying mastery is that people are more motivated when there is a continuing challenge in their job that requires them to keep learning new skills. The intention was that those disagreeing with the statement would consciously be aware that there were more skills required to fully master their job, and so would still be challenging themselves to attain these skills. As can be seen this aspect of mastery did not correlate with motivation, and a possible reason for this could be that testers are more comfortable in their role when they feel they have mastered most of the skills they require. This highlights the difficulty of crafting questions to measure such complicated attributes as mastery and how the availability of the Job Diagnostic Survey questions as a basis for the JCM made creation of the questions related to MPS far easier. In future studies this question should be rewritten to more clearly focus on the intended mastery factor.

Figure 5 shows the results of combining the factors into the three characteristics. Mastery is included twice – once with the anomalous question results included (Mastery*) and once without these results. The remaining analysis is based on values for Mastery that excludes the anomalous question.

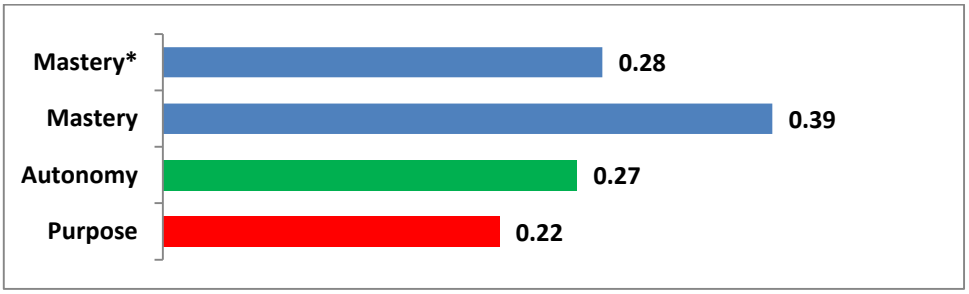

Figure 5: Motivation 3.0 Characteristics correlation with Perceived Motivation

The Best Motivation Model for Testing

Using the Hackman and Oldham MPS formula combines the JCM characteristics to produce the Motivating Potential Score (MPS) and this resulted in an overall correlation of 0.4, substantially higher than any of the five component characteristics (shown in figure 3). Simply summing the same five MPS characteristics gives a lower correlation of 0.38, which is somewhat surprising as one of the conclusions of the JCM meta-analysis [5] was that a summative formula was generally a better predictor than the original formula – but obviously not for this data set.

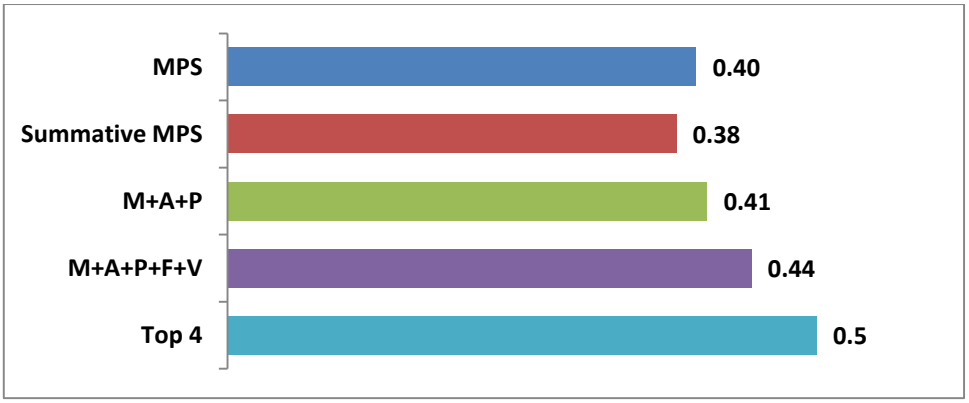

Figure 6: Motivation Models correlation with Perceived Motivation

Daniel Pink provides no formula for combining his suggested three characteristics, and no prioritization, so a simple summative approach was used – this resulted in a correlation with perceived motivation of 0.41, which is slightly stronger than the best MPS correlation.

It was hypothesised that a combined JCM-MAP model may give a better correlation, but given the poor individual correlations provided by task significance and task identity these were excluded from this combined model. Thus a simple summative model including Mastery, Autonomy, Purpose, Feedback and Variety (M+A+P+F+V) was tried and a correlation of 0.44 resulted.

Given access to the correlation scores for each of the individual factors and an additional factor based on the tester's work environment, it was considered worthwhile measuring the correlation on this highest scoring subset of factors. The questions associated with these factors are shown below:

- "In my job I get the chance to work on many interesting projects." – Annex A Q13 VARIETY 2
- "My job does not challenge or stretch me." (Negative question) – Annex A Q14 MASTERY 1
- "I often become so engaged in my work that I forget the time." – Annex A Q16 MASTERY 3
- "My work environment encourages me to perform my job better." – Annex A Q20 ENV'T

The resultant 'Top 4' model achieved a correlation of 0.5. Figure 6 shows the results for the five different motivation models studied.

NOTE: All correlation results in this subsection have statistical significance exceeding a confidence level of 99% ($p<0.01$).

Smarter Motivation

Given the high number of survey respondents, it is not only possible to derive highly statistically significant results for motivation for testers in general, but it is also possible to compare motivation results for different sub-groups of testers using the provided demographics.

Different Tester Roles

It was hypothesized that testers in different roles would have different levels of motivation and be motivated by different job characteristics. The motivation scores for the six most popular testing roles were compared as shown in figure 7. All scores were normalized to the MPS score for all testers, which is the measure shown on the vertical axis. As can be seen, the four different models considered provide quite different measures of motivation for the different testing roles. The columns corresponding to 'Perception' relate to the perceived motivation reported by respondents.

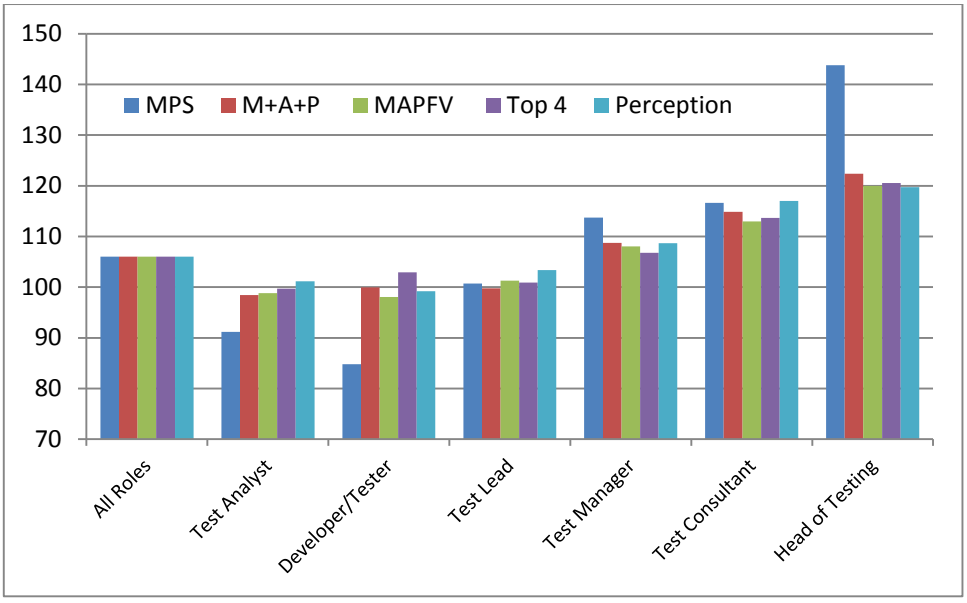

Figure 7: Motivation Models correlation for different roles

The average MPS for all roles is 106, but for a tester in a Developer/Tester role it is 85, whereas for a Head of Testing it is 144; this increase in MPS score as level of responsibility increases is expected. The far higher score for Heads of Testing is due to high scores for autonomy, task variety and task significance – so it appears that these testers have control of their own time, perform a diverse set of activities and believe that what they do is important.

When compared to the other models MPS appears to exaggerate the differences between the roles, but the relative positions are much the same. It was expected that as roles provided greater responsibility and presumably more autonomy there would be higher levels of motivation, which is what can be seen in these figures, although it was expected that Test Leads would be relatively more motivated than they are.

The MPS scores for Developer/Testers are notable for a strong negative correlation between task significance and perceived motivation (-0.55, $p<0.01$) – this implies they find that performing tasks that affect their colleagues or impact the project to be demotivating, while Test Consultants find such responsibility positively motivating (+0.4, $p<0.01$). There are also some surprising differences between the correlations for Developer/Testers and Test Analysts. Developer/Testers show a strong correlation between purpose (+0.56, $p<0.01$) and perceived motivation, whereas there is no significant correlation for Test Analysts in this area.

Feedback, one of the most important characteristics of the JCM, changes a lot across the roles in its correlation with perceived motivation. This was expected, but it was thought that the more senior roles would require less feedback; however the Heads of Testing and Test Managers both had strong correlations while Team Leads and Developer/Testers showed no significant correlation in this area.

In terms of variety, all roles (other than consultants) find the fact that they work on multiple projects motivating, and all but Consultants and Heads of Testing appear to find it frustrating that they do not have a wider range of activities to perform.

As part of the study, respondents were asked what specific activities they perform – figure 8 shows the percentage of respondents that selected each of the top eight activities.

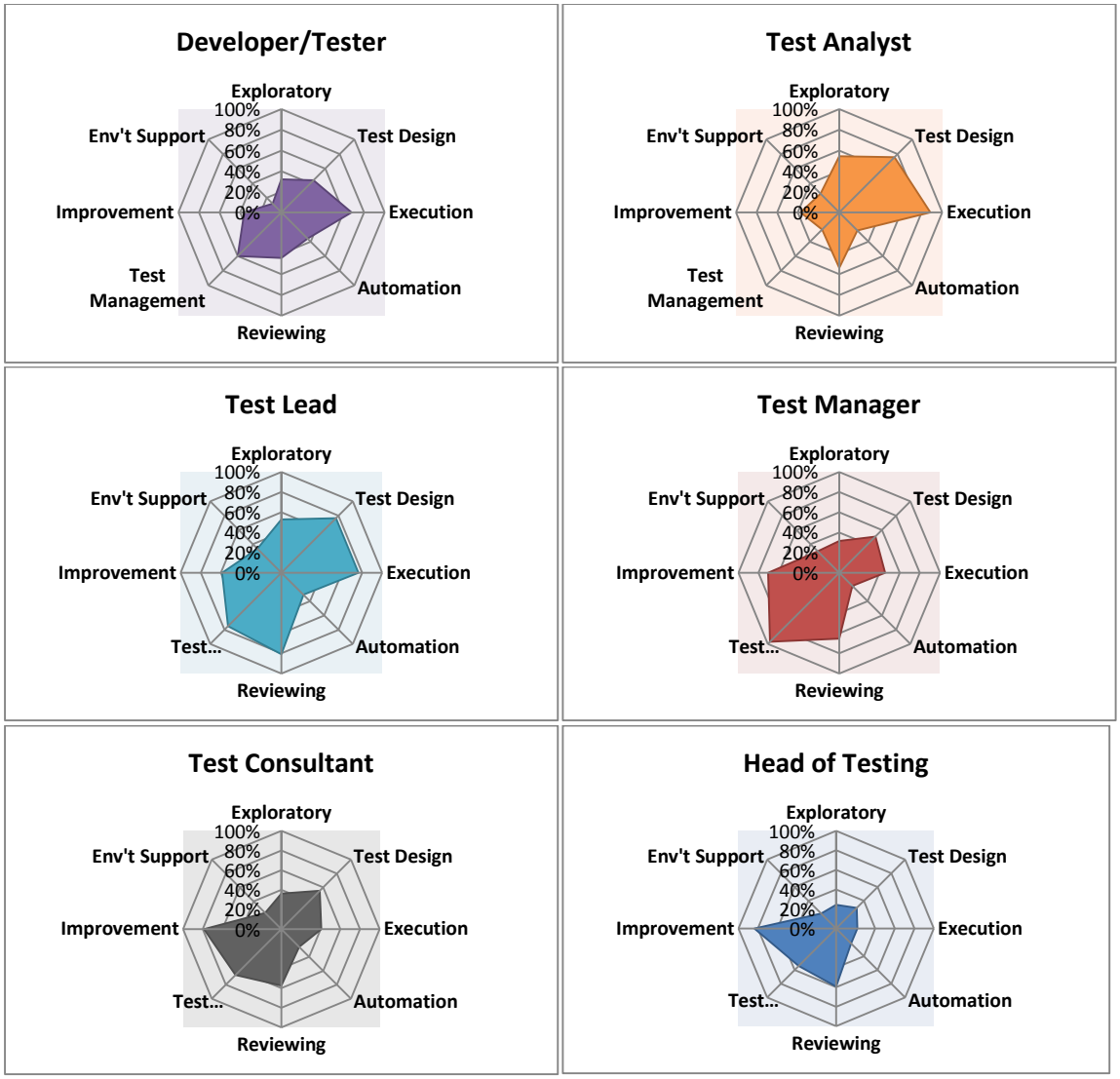

Figure 8: Test Roles vs. Test Activities

Only Test Analysts did less reviewing than test design, and all roles did more test design than exploratory testing. Process improvement was performed by respondents in all roles to some extent, but a higher percentage of Consultants and Heads of Testing were involved in this activity. Test management was performed by over 50% of respondents for all roles except Test Analysts, where only 24% performed this activity.

Life Cycles

Each respondent provided information on the life cycle model they were currently using and it was expected that those using an agile approach would be more highly motivated than those following other approaches. This was true overall, but only marginally, and this was not the case for test analysts, who reported being more highly-motivated working on non-agile projects. Working on maintenance projects was the least motivating. Overall there is no statistical difference between the motivation of testers working on different life cycle models.

Company Size

The size of company where testers work initially appears to have a small effect on their perceived motivation, but this is not statistically significant. The best places to work appear to be either on your own or in a company of between 10 and 50 employees. The size with the lowest motivation was 50 to 250 employees, so there appears to some dynamic affecting motivation as companies grow into the 50 to 250 employee range.

This could be related to this group size exceeding the Dunbar number [14]. As companies get larger than 250 employees motivation appears to increase again.

Single-person companies (singletons) exhibit some specific characteristics with respect to motivation, some of which could be due to them performing specialist roles for larger companies. Feedback from clients is especially important to the motivation of singletons, while they consider autonomy to be irrelevant. Seeing projects through to completion is strongly negatively correlated for singletons, but strongly positively correlated for very small companies of 2 to 10 testers, and less positively correlated for larger companies. Job variety in terms of the different tasks performed is moderately negatively correlated for singletons, but strongly positively related for very small companies of 2 to 10 testers and negligibly related for the other company sizes. Mastery is irrelevant to singletons and companies with 10-50 employees, but strongly correlated with motivation in companies of other sizes.

Experience Levels

Testers perceived that those with more than 10 years' experience had the highest level of motivation, while those with 1 to 3 years' experience had the lowest level of motivation, but the differences were not statistically significant. The surprising result from considering the number of years' testing experience is that for each of the different experience lengths a different characteristic was found to be the most likely predictor of motivation (all at $p<0.01$) – these are shown below:

- <1 year Skill Variety
- 1-3 years Supervisor Feedback
- 4-6 years Task Identity
- 7-10 years Work Environment
- >10 years Mastery

Organization Types

Respondents worked in a variety of different types of organization with those working in IT Organizations perceiving they had the lowest motivation, although the correlation between motivation and different organization types was not statistically significant. Those working as self-employed contractors perceived they had the highest motivation (although there were only 13 self-employed contractors in the survey, so not a statistically valid sample). The second highest motivated group were those working in Testing Services.

For IT Organizations the 'Top 4' model is far more strongly related to perceived motivation than MPS. This 'Top 4' model is also the only model that can be validly related to motivation ($+0.54$, $p<0.05$) for Self-Employed Consultants given that there were only 15 respondents in this category.

Feedback was moderately and strongly related to motivation for those working in IT Departments and Testing Services, but there was a negligible relationship for those working in IT Organizations. Task Identity was related to motivation for those working in IT Organizations and IT Departments, but was not for those working in Testing Services.

MOTIVATES		DEMOTIVATES	
Challenges & New Areas	17%	Poor Management	20%
Feedback & Appreciation	15%	Lack of Appreciation	16%
Quality & Making a difference	15%	Repetitive Tasks	13%
Team & Work Env't	10%	Ignored Exit Criteria	11%
Money	7%	Team & Work Env't	5%
Meeting Targets & Job Satisfaction	7%	Developers	5%
Autonomy	5%	No Goals/Objectives	5%
Good Management	5%	Poor Process	4%
Training & Career Path	4%	Changes to Req'ts/Schedule	4%
New Technology & Tools	3%	Money	3%
Respect & Trust	3%	Blame for defects	3%
Developers	3%	Bad Software	3%

Table 1: Motivating and Demotivating Factors

What Motivates and Demotivates Testers?

Respondents were given the opportunity to separately suggest what they believed motivates and demotivates testers through open-ended questions. Table 1 shows the top 12 factors for each - the figures represent the percentage of all suggestions made by respondents (some provided multiple responses).

Conclusions

The conclusions are presented in two parts; first those covering the application of the motivation models to software testers and second those considering how motivation can be applied to more specialist groups of testers, such as those in specific roles or those with different levels of experience.

Conclusions - Motivation Models

See figure 6 for the strengths of the correlations of the different motivation models with perceived tester motivation. Note that all correlation scores in this subsection are at $p<0.01$.

1) When considering the individual factors in the JCM used to generate the MPS, the ability to work on many interesting projects is the best predictor of perceived motivation (+0.39).
2) Of the five MPS characteristics, Feedback (+0.3), Autonomy (+0.27) and Variety (+0.29) were moderate predictors of perceived motivation, while Task Significance and Task Identity did not relate so well. As MPS only requires three characteristics to score well (as long as they include Feedback and Autonomy) then this indicates that MPS can be used for testers.
3) Despite its age, the MPS score of +0.4 shows that the JCM still provides reasonable guidance on designing jobs to be more motivating. The slightly lower score of +0.38 for the summative MPS model seems to contradict the results reported in the Fried & Ferris meta-analysis [5], but it is apparent that MPS scores tend to exaggerate differences (e.g. see figure 7) more than the perceived motivation and this could well be due to the multiplication in the formula.
4) The formula created for the Motivation 3.0 model was simply the sum of the three characteristics suggested by Daniel Pink, but, even so, this resulted in a slightly stronger correlation (+0.41) than for the MPS. This implies that this, too, could be used as the basis for motivating testers.
5) The combined model, taking the three characteristics from Motivation 3.0 and the three best correlating scores from MPS resulted in the M+A+P+F+V model (including Mastery, Autonomy, Purpose, Feedback and Variety). This model provides an even stronger correlation with perceived tester motivation at +0.44 and so should presumably be used in preference to the other models, where appropriate.

6) The strongest correlation of +0.5 was achieved by combining the four top correlating factors measured by the survey ('Top 4'). This group was strongly influenced by Mastery, and also included the opportunity to work on a variety of projects and the work environment of the tester.
7) For all the motivation models (MPS, Summative MPS, MAP, M+A+P+F+V and Top 4) those jobs with greater responsibilities (and generally requiring more experience) have higher motivation scores. This could be because those who continue to work in testing do so because they enjoy it. Test Analysts perceive themselves to be slightly better motivated than Developer/Testers, and score more highly on all the models except M+A+P+F+V.
8) Herzberg's theory that 'those factors that motivate an individual are different from those factors that demotivate them' was not shown to be true. However, it can be seen from Table 1 that the motivating and demotivating factors are certainly not the same and differ in popularity. Notably 20% of comments suggested bad management was demotivating, whereas just 5% commented that good management was motivating. Feedback and Appreciation were suggested as the second most common motivator, however see the next set of conclusions to see why this is not applicable to all testers.

Conclusions – Smarter Tester Motivation

Given the high number of respondents to the survey it was possible to draw statistically significant conclusions about smaller subsets of this group. These conclusions show that we should not treat all testers the same, as testers in different circumstances (e.g. roles, level of experience) are motivated by different factors and so should be treated differently. Thus it should be possible for those attempting to motivate testers to intelligently manage their efforts depending on the particular circumstances of the testers.

1) Developer/Testers find performing tasks that affect their colleagues or impact the project to be demotivating, suggesting that managers should not emphasise the significance of their work to them. This same group find the belief that their jobs have a wider purpose to be motivating – this is not the case with Test Analysts.
2) Feedback is not a strong motivator across all roles, but perhaps surprisingly, it is most important to those in more senior roles, such as Head of Testing and Test Manager.
3) The opportunity to work on a variety of projects is a strong predictor of motivation for all tester roles, but having a variety of different tasks to perform on those projects is not important to those in more senior roles, such as Head of Testing and Test Manager.
4) Working on agile projects is not as motivating as expected – testers on agile projects appear to be only slightly more motivated than testers working on iterative (non-agile) projects – and in fact statistically there is not a significant difference in motivation between testers working on different life cycles.
5) Those testers working in their own companies have some unique characteristics, but are among the most motivated. If choosing a size of organization to work in, the average tester may find they are most motivated in a 'small' (10-50 employees) organization, but this result is not statistically significant.
6) If you are managing a team of testers with a range of experience, be aware that for each experience level the most important predictor of motivation (i.e. what it would be most helpful to improve for increased motivation) changes for each experience level. Thus a range of approaches need to be employed to address the different team members.

Further Work

There is still considerable further analysis of the original data set to be performed. For instance, there is data (and its effect on motivation) that is yet to be analysed, such as education levels, salary and the part of the world the tester works in. So far all the analysis has been one and two dimensional, but there is the potential to perform further analysis using a multi-dimensional approach (e.g. look at different tester roles in different life cycles, or whether levels of experience affect motivation in different organization types).

Further surveys should be performed to validate the results of this first survey. There is potential to improve some of the questions and it would also be useful and informative to increase geographical coverage, which is currently largely restricted to Australasia and Europe.

Given the excellent response to the first survey, an attempt should be made to follow up with the first set of respondents to create a form of longitudinal study to look at how motivation changes over time.

Acknowledgement

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Annex A – Survey Questions

These questions were presented in random order in the survey. To allow consistency checking of the responses, approximately half the questions were negatively worded, which means they were reverse scored.

1	FEEDBACK 1	The work itself provides feedback on how well I am doing in my job. (POSITIVE)
2	FEEDBACK 2	My colleagues provide little or no feedback on how well I perform. (NEGATIVE)
3	FEEDBACK 3	My supervisor provides me with regular feedback on my performance. (POSITIVE)
4	AUTONOMY 1	Most of the time someone else decides what tasks I should do next. (NEGATIVE)
5	AUTONOMY 2	My job is flexible enough to allow me to decide which hours I work most days. (POSITIVE)
6	AUTONOMY 3	For most tasks I get to decide who I will work with. (POSITIVE)
7	AUTONOMY 4	I rarely get to choose the way that an activity is carried out. (NEGATIVE)
8	SIGNIFICANCE 1	My job is one that affects few other colleagues. (NEGATIVE)
9	SIGNIFICANCE 2	If not done well my job will have little impact on the project. (NEGATIVE)
10	IDENTITY 1	My job allows me to see projects through to completion. (POSITIVE)
11	IDENTITY 2	I often start tasks but then pass them on to colleagues before I finish them. (NEGATIVE)
12	VARIETY 1	My job comprises a relatively small number of different tasks. (NEGATIVE)
13	VARIETY 2	In my job I get the chance to work on many interesting projects. (POSITIVE)
14	MASTERY 1	My job does not challenge or stretch me. (NEGATIVE)
15	MASTERY 2	I have mastered most of the skills required to perform my job. (NEGATIVE)
16	MASTERY 3	I often become so engaged in my work that I forget the time. (POSITIVE)
17	PURPOSE 1	My job includes the opportunity to work for the good of the wider community (beyond my employer). (POSITIVE)
18	PURPOSE 2	My organization is primarily focused on increasing its profits. (NEGATIVE)
19	PERCEPTION	I am highly motivated to do my job in testing. (POSITIVE)
20	ENVIRONMENT	My work environment encourages me to perform my job better. (POSITIVE)