Developing Skill Standards Built Upon High Performance Work Organization Practices

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The National Skill Standards Board (NSSB) was established by Congress in 1994 under the aegis of the Department of Labor for the purposes of creating skill standards and certifications for front line workers and supervisors in fifteen industry sectors in the U.S. economy. The legislation identified certain goals and objectives including, the standards will "…take into account the requirements of high performance work organizations." The goal of creating skill standards that are based on high performance work is completely understandable. If the United States is to compete globally, then any strategy that improves competitiveness is welcome. Following this logic, national skill standards should be based upon skill and work requirements that arise in organizations that perform at the highest level. But this presents a difficult challenge. What organizations perform at the highest level? How is high performance recognized? What criteria are used to define high performance – market share, market capitalization, human resources practices, stock price? How can it be measured? The NSSB research team recognized the need for a measurement tool that would identify high performing organizations and then use the tool to determine if the skill standards would be different if they were based upon high performing groups only - compared to setting the standards based upon a sample that was representative of the entire industry. The research team included a short survey of high performance workplace in their national validation survey for manufacturing. Results from this survey and work to develop a more extensive survey are described in this paper.

There are several literatures that examine characteristics of high performing organizations or whose research relates to organizational performance. These literatures include sociotechnical work design, leadership, customer-service orientation, human resources practices, quality and teams. The empirical findings in these literatures form a good source for potential items to be included in a high performance workplace survey.

Numerous studies (Huselid, 1995; Guzzo, Jette, and Katzell, 1995; Gerhart, Wright, and McMahan, 2000, Wiley & Brooks, 2000) have examined the relationship between certain human resources practices and the financial performance of the firm. These researchers have reported significant correlations between a firm's turnover and financial performance, on the one hand, and their recruiting, selection, training, grievance procedures, performance appraisal system, and incentive plans. For example, Huselid obtained financial data from 10-K reports and high performance workplace surveys from over 900 US firms. He found significant correlations between employee productivity and turnover and HR practices such as recruiting, training, employee motivation and organizational structures. Gerhart, et. al. commented on Huselid's and others' findings and cautioned researchers in this area. They stated that researchers should obtain survey data from multiple raters for each sub-group in an organization and that the use of sub-groups as the unit of analysis provided a more reliable measures. Also, the researcher must be clear that the survey results report actual practice and not just stated policy; they are often different.

The customer service orientation of a firm has been shown to relate to customer satisfaction. Customer satisfaction, in turn, is related to repurchase decisions and positive word-of-mouth advertising. Schneider, White, and Paul (1997) reported on a study in which they measured the customer service climate at 126 bank branches and obtained customer satisfaction surveys from patrons of the 126 branches. This group level data was then analyzed. The branch customer service climate was measured on characteristics such as work facilitation, inter-department service, customer service management practices, customer feedback, and managerial practices. These factors significantly

correlated with customer perception of service quality. These results reconfirmed similar findings in an earlier study. In a study by Johnson (1996), the research confirmed these findings in which seeking and sharing information about customer needs and expectations, training employees in the skills needed to deliver quality service, and providing rewards and recognition to employees who provided excellent customer service, were significantly related to measures of customer satisfaction.

Research on teams also provides information about the linkages between firm performance and team characteristics. Campion, Papper and Medsker (1996) examined five characteristics of teams and their relation to productivity, employee satisfaction, and managers' judgments of team effectiveness. In this study, teams were intact work groups with a manager (team leader) and employees (team members). Results indicated that high performing teams performed a variety of tasks that they perceived to be important to the organization, were dependent on each other to perform tasks, obtained feedback and achieved goals, and functioned as a single team. They were well supported by management with training and information needed to perform their work. In a study of the purpose and design of teams, Bacon and Blyton reported that teams were formed for both economic and social-cultural purposes and an environment of few layers of management, flexible job descriptions, and few pay bands was correlated with plant competitiveness, product quality and employee satisfaction.

The characteristics of top executives have a direct impact on firm performance. Rucci (2002) summarized the leader characteristics research in his efforts to describe what the best business leaders do that makes them the best. He identified seven key characteristics including business acumen, customer orientation, results orientation, strategic thinking, innovation and risk taking, integrity, and interpersonal maturity. These seven characteristics should be found among leaders in high performance work places.

In summary, each of these literatures contributes to an understanding of how a high performance workplace might be defined. All of the research reports on aspects of organizations that are important to its overall success. Every organization has leaders, supervisors, teams, HR practices, and customers. The industrial-organizational literature has examined these areas and identified many factors to be included in a survey of high performance organizations. A construct valid instrument must reflect these different literatures.

Skill Standards and High Performance Organizations

The US manufacturing industry has declined in the past two decades while foreign competitors have grown. There is no surprise, then, that one of the first industries the NSSB selected to establish skill standards was the manufacturing industry. The NSSB selected frontline production workers as the target groups to establish skill standards. Frontline workers included those who perform manufacturing work as their primary job duty and their supervisors.

At stated above, the National Skills Standards Act has several goals. One goal is to "facilitate the transition to high performance work organizations." The research team considered different approaches to achieve this goal. One approach the research team used was to instruct subject matter experts who were developing the skill standards to reflect upon high performance work organizations they knew and develop the skill standards in accordance with standards in those high performance organizations. In addition, when the draft skill standards were nearly completed, subject matter experts from a group of high performing organizations were convened and asked to review the skill

standards to ensure they matched the skill requirements of their organizations. While these approaches were reasonable, the research team needed a more objective and empirical approach. Accordingly, a brief high performance organization scale was constructed and included in the content validation survey that was administered as the final step in the development of the skill standards. The research team reasoned that the scale could differentiate those who worked in a high performance organization from those who did not. High performance workplace scores could then be obtained for each rater. The skill standards ratings for the two groups could be compared. The researchers could then determine if those who had high scores on the scale made different ratings and established different skill standards than those with low scores. If differences were discovered, the skill standards would be set in accordance with the standards of high performance organizations.

Method

Description of the MSSC National Validation Survey

The skill standards research was conducted for six types of frontline work, including production, quality assurance, logistics and inventory control, health and safety, manufacturing production process development, and maintenance, installation and repair. These types of work were referred to as concentrations. For each of these concentrations, approximately 50 focus groups with hundreds of subject matter experts were held to create the critical work functions and key activities needed to establish the skill standards. These subject matter experts also provided ratings for performance indicators and skills. The final step in the development and validation of the critical work functions and key activities was to collect importance ratings from frontline workers by means of a nationwide survey. During six months in the middle of 2000, 8,334 validation surveys were distributed to workers in 787 companies. The response rate was 40%, for a total of 3,227 respondents.

The validation survey was comprised of fifteen demographic questions, twelve high performance work organization questions, rated on a five-point scale, and 36 yes-no ratings to determine which critical work functions frontline workers performed. If a worker performed a critical work function and selected "yes," the worker then rated the critical work function and its key activity on a five-point scale. If the worker rated "no," the worker skipped that critical work function and moved to the next critical work function. Using this approach, a respondent could make up to 220 ratings if all 36 critical work functions were performed by the respondent. See Table 1 for an example of critical work functions and key activities.

The high performance rating scale and the 12 items included in the survey are listed in Table 2. These items were selected because they represent empirically established relations reported in the high performance literature. The research team prepared the wording of the items to be suitable to the manufacturing setting. The rating scale was a simple five-point Likert-type scale.

The researchers first analyzed the psychometric characteristics of the 12 item, high performance scale to ensure it "worked" as a meaningful scale. The researchers used a latent trait Rasch model to examine the scale. Following the analysis of the scale, the researchers then examined the relationship between the scale score and the critical work function and key activity ratings. High performance scale score differences among demographic subgroups were also analyzed.

Results

Latent trait model

Latent trait models of measurement are contrasted to classical test theory approaches and possess some distinct advantages. The latent trait model approach makes it possible to obtain a score for the object of measurement that is independent of the idiosyncrasies of the measurement event. That is, the score is independent of the items, raters, and rating scale selected. Since validity is the accuracy of inferences made from a score, the independence of a score from these facets of measurement is highly desirable.

In the latent trait approach, the quality of a rating scale can be assessed by examining statistics and tables that provide information about important aspects of a valid and meaningful scale including the distribution of the scores, how well the measurement and items discriminate, the "difficulty" of each survey item, scale dimensionality, the presence of "aberrant" raters, and the adequacy of the scale points used in the rating scale. In other words, if a five-point scale was used in the survey, did the scale points actually function as five distinct levels of measurement or was the five-point scale actually a three-point scale. The latent trait analysis was performed using WINSTEPS (Linacre, 1996).

The results indicated that the 12 item scale functioned well. One important characteristic of a brief scale is unidimensionality. Table 3 presents the results of a principal components analysis. The loadings for all 12 items are quite high, all exceed .45, and 10 of 12 exceed .60. Figure 1 contains a Scree plot that depicts the sharp drop in eigenvalues following the first dimension. The first principal component accounts for 45% of the variability among the items and only the first principal component is greater than 1.0 (Table 4). These results indicate clearly that the 12 item scale is one dimensional.

A second characteristic of a good scale is that the scale points make meaningful distinctions among levels of the trait being measured and that the scale is monotonic. That is, the scale points increase smoothly for low to high. Table 5 provides the average observed score for each of the five scale points and the sample expectation. The scale point averages range from –11.3 to 14.0 and the average for each successive step is proportionately larger than the preceding step. The observed averages are very similar to the sample expectations. The results indicate that the five-point scale functioned well as a five point scale.

Finally, the quality of a scale is assessed by how well the observed data fit the model. Two indications of fit are the Infit and Outfit statistics for raters and items. The expected value for the Infit and Outfit statistics is 1.0. When the statistic is less than 1.0 (0 - .5) it indicates redundancy in the data or more consistency among the ratings than expected. Values greater than 1.5 indicate the presence of outliers. The Infit and Outfit results are contained in Tables 6a and 6b. They are quite close to 1.0 indicating that the 12 items and raters fit the measurement model well.

One helpful output from a latent trait model analysis is a rank ordering of the items included in the survey that is made possible as a result of the interval scale created from the latent trait analysis. Table 7 contains the model measures for each of the 12 items included in the survey. From the table it can be seen that the "easiest" items were *minhaznd* (Formal programs exist to minimize occupational and environmental hazards) and *comput* (Computer-based process controls are used in the manufacturing process) and the most difficult items were *futskil* (Front line workers are informed of the future skill-needs of the company to allow them to maintain marketable skills) and *feedbk* (Front line workers

receive feedback from customers about their work). In this context "easiest" means that to rate highly on the item the organization being rated does not have to be very high performing and "difficult" means that the organization must be very high performing to receive a high rating on the items.

In summary, the latent trait model results indicated that the 12-item high performing work group scale included in the national validation survey functioned well as a measurement. The five-point scale was meaningful, it was unidimensional, and the data fit the measurement model well. Consequently, the researchers proceeded with their analyses of the relation between the skill ratings using the sum of the ratings for the 12 items as the measure of high performance.

High performance workplace and demographics

The sum of the ratings provided by each rater for the 12 items that comprised the high performance workplace scale was analyzed for demographic characteristics of the raters. The means, standard deviations and sample sizes for race (coded as white and other), gender and whether a rater worked in a union environment or not are reported in Table 8. A review of these means reveals that the highest mean, 36.81, was found for non-white women who did not belong to a union. The lowest mean was found for white males and females who were members of a union with means of 33.31 and 31.41 respectively. Table 9 contains the ANOVA results for these means. The table indicates significant main effects for union, gender and race and a significant interaction for union membership and race.

The sum of the key activity ratings for each of the 36 critical work functions was calculated and their means, standard deviations and sample sizes are reported in Table 10. Differences in the sample sizes are due to the fact that the instructions directed the raters to rate only those key activities that they performed on the job. The sample sizes then reflect those key activities that are performed most often. Differences among the means of the critical work functions are due to differences in the number of key activities that comprise each critical work function. Critical work function 19 had the fewest with only two key activities associated with it and critical work functions 15 and 27 had the most key activities with 8 each.

The sum of the ratings provided by each rater for the 12 items that comprised the high performance workplace scale was also used to analyze the importance ratings for the key activities and critical work functions.

In order to assess the relation between working in a high performance workplace and the importance raters attributed to key activities and critical work functions, several analyses were conducted. Table 11 contains the means, standard deviations and sample sizes for the sum of the key activity ratings for each concentration for high and low high performance workplace ratings (split at the median). Comparing the means within each concentration reveals that there is a consistently higher importance rating for all concentrations for those who had greater high performance workplace ratings. Table 12 contains means, standard deviations and sample sizes for a similar comparison of high and low high performance workplace ratings for each of the 36 critical work functions. The findings are the same as for the concentrations. Raters rated the key activities higher when the rater scored "high" on the 12-item high performance workplace scale.

These results are also evident when the sums of the 12-item high performance workplace scale were correlated with the sums of the key activities for critical work functions and concentrations. Tables 13 and 14 contain these Pearson correlations. The tables reveal consistent moderate to low positive correlations between the high performance workplace scores and the sums of key activity ratings importance ratings for critical work function and concentrations, respectively.

In summary, these findings indicate that there is a consistent and positive trend to rate all key activities as more important when the rater perceives the work place to be high performance. This tendency is was found for almost all critical work functions and was found for all concentrations. In addition, although not reported here, the researchers also discovered a positive correlation between the tendency to report that a critical work function is performed (yes-no rating) and the rating of high performance.

Discussion

The purpose of this study was to determine whether or not the work performed in a high performance workplace is different than the work performed in an organization that is not rated as high performance. To achieve this, the researchers first established the psychometric quality, using a latent trait model, of a 12-item high performance workplace scale included in the national skill standards research for frontline manufacturing workers. Following the assessment of the worthiness of the rating scale the researchers examined the high performance workplace rating differences between demographic characteristics, including race, sex and union membership. Finally, the researchers examined the relationship between ratings of high performance using and importance ratings for key activities.

The researchers found that the 12-item scale had good measurement characteristics. It was unidimensional, the five-point rating scale made meaningful distinctions at each point on the scale, all 12 items "fit" the data well and contributed to the measurement. While these are important findings for this study, a brief 12-item scale does not adequately represent all the constructs that research suggests should be part of the "nomological net" that defines a "high performance workplace." For example, the scale includes one item about teams (Work teams are used in most phases of the manufacturing process). There are no items in the scale regarding the effectiveness of the team, team dynamics, or team leadership. These characteristics of teams and others have been found to be important to the successful functioning of teams. It would seem reasonable that high performance workplaces, not only have teams, but have teams that function effectively.

Similarly, there is one item in the scale about customer feedback (Front line workers receive feedback from customers about their work). Recent research has established a relationship between "customer-service" oriented workplaces and customer satisfaction that, in turn, is correlated to repeat sales and positive word of mouth advertising. Again, presumably, high performance organizations not only provide customer feedback to employees, but they act upon it, measure their performance on the basis of the quality of their customer service and have work procedures that are "customer friendly." None of these elements were included in the 12-item scale.

The research team is now working on a larger scale that measures a wider range elements from the "nomological net" that a decade of research suggests should comprise a measure of high performance workplace. A 73-item scale that drew items from a wide range of literatures including socio-technical

work design, quality programs, customer service orientation, teams, human resources practices, empowerment practices and work-life balance is currently being piloted. This more comprehensive scale can provide more insights into the nature of the positive correlations found in this study.

The findings that there were high performance workplace rating differences between men and women and between whites and others may reflect differences in expectations about the workplace. Recognizing that the ratings are individual rater perceptions of the high performance nature of the workplace and not actual measures, it is reasonable to speculate that women and other minorities have different expectations of the workplace. Their expectations may be lower than that of white men. Their expectations of the workplace may be exceeded compared to white men. Consequently, they rate their workplaces more positively. Conversely, white men may truly have a different experience in the manufacturing workplace than women and other minorities and the ratings reflect that difference. More research is needed to understand this difference.

The finding that union members rate the workplace lower than non-union members has been noted in studies of job satisfaction. The finding may reflect the heightened awareness of workplace issues that may be present in a union setting compared to a non-union setting. Another explanation may be that the union companies included in this study were older and struggling manufacturing companies and the lower high performance workplace scores are due to differences in industries and not to union membership.

Finally, the finding that ratings from workers in high performance workplaces are positively correlated with their ratings of the importance for key activities is an important finding. The National Skills Standards Act requires that skill standards be set with consideration given to the practices of high performance workplaces. This research was intended to gain insights into the nature of the relationship between high performance workplaces and skill standard setting. This relationship has important implications for skill standards. For example, it those in high performance workplaces rate different key activities as important compared to those in "low" performance workplaces, the standards will have to align with those ratings.

These findings suggest there is an overall tendency for workers in high performance organizations to endorse more key activities as ones they perform and they uniformly rate those key activities as more important than those in "low" performing workplaces. The implication is that when using ratings to set a "cut-off" for selecting critical work functions and key activities for inclusion in the skill standards, using the importance ratings from workers in high performance workplaces will mean that more critical work functions and key activities will be considered important and be included in the standards.

There are limitations to the conclusions that can be reached from this study. First, the skill standards are established based upon the work performed and the *skills* required for the work identified as important. This study includes only ratings of the importance of work. It remains for future research to determine if there are similar differences found in the skill ratings between high and low performing workplaces.

Second, as noted earlier, the 12-item scale does not include important aspects of a high performing workplace. Studies regarding work design, customer service orientation, and teams, to name a few,

indicate that important aspects of the organizations were not included in the measure of high performance. Studies using an instrument that is more construct valid are required.

Third, the ratings provided are rater perceptions of their organizational characteristics. One may challenge the survey results claiming that it is a measure of worker satisfaction and not a measure of high performance workplaces. A research design that includes five to 10 raters from one or two work groups in each of several hundred organizations would provide work group scores. These scores may yield different results and be a better measure of the high performance characteristics of the organization.

Finally, all of the data collected in this study were ratings on a five-point scale. The potential effect of common method variance must be assessed and more effectively managed in future research.

In summary, this study examined the relationship between ratings of high performance workplaces and importance ratings for key activities (job tasks) for 3,227 frontline workers in over 750 manufacturing organizations. The results indicated a positive correlation between working in a high performance organization and ratings of key activities. Those in high performance organizations made higher importance ratings. These results have implications for setting skill standards – an important goal of the National Skill Standards Board. These findings will be further investigated through better research design and a more construct-valid measure of high performing workplaces.

Table 1 – Two examples of critical work functions and key activities for the Production Concentration.

Concentration:	Production
Critical Work Function:	Produce product to meet customer needs.
Key Activity:	Identify customer needs.
	Set up equipment for the production process.
	Perform and monitor the process to make the product.
Concentration:	Production
Critical Work Function:	Coordinate work team to produce product.
Key Activity:	Make job assignments.
	Monitor work team goals.
	Promote career development.

Table 2 – The 12 high performance workplace items included in the survey

1. Goal: Front line workers are regularly informed of corporate goals and priorities.
2. Decision: Front line workers are involved in the decisions that affect their work.
3. Team: Work teams are used in most phases of the manufacturing process.
4. Train: Training is provided to front line workers regularly.
5. Qualimp: Front line workers are involved in quality improvement programs.
6. Feedbk: Front line workers receive feedback from customers about their work.
7. Minhznd: Formal programs exist to minimize occupational and environmental hazards.
8. Comput: Computer-based process controls are used in the manufacturing process.
9. Futskil: Front line workers are informed of the future skill-needs of the company to allow them to maintain marketable skills.
10. Conimp: Front line workers are included in continuous process improvement programs.
11. Impprod: Front line workers help to improve products to respond to customer needs.
12. Lean: Front line workers participate in lean and agile manufacturing processes.

Figure 1 – Scree plot for the 12 high performance items

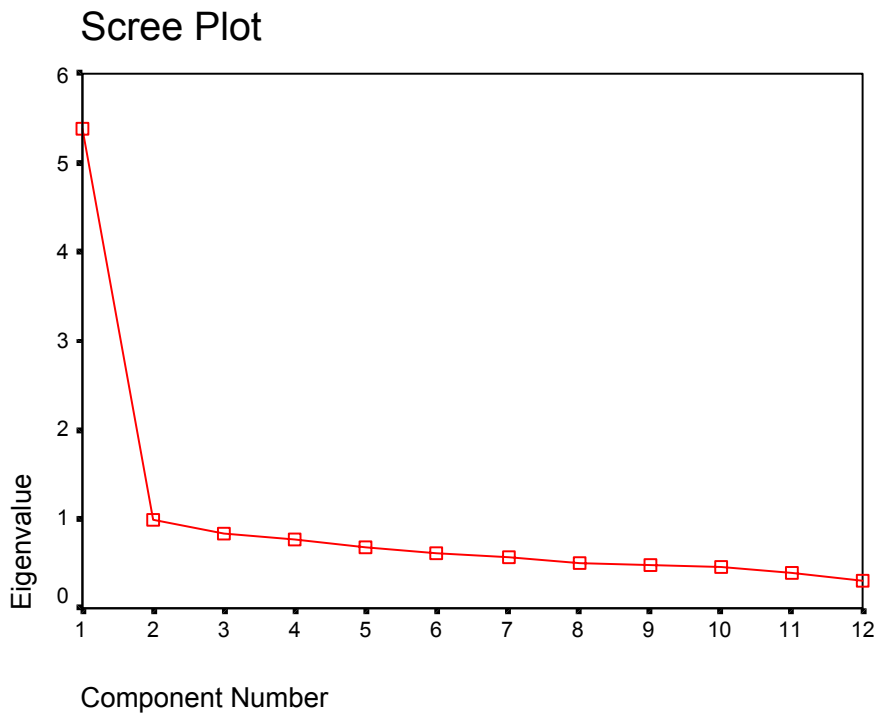

Table 3 – Principal component analysis results for the 12 high performance items

Principal Component Analysis.

Item	Loading
GOAL	.643
DECISION	.660
TEAM	.616
TRAIN	.674
QUALIMP	.761
FEEDBK	.616
MINHZND	.560
COMPUT	.450
FUTSKIL	.741
CONIMP	.802
IMPPROD	.739
LEAN	.695

Table 4 – Eigenvalues and percentage of variance accounted for by each factor

	Eigenvalues		
Component	Total	% of Variance	Total %
1	5.380	44.831	44.831
2	.987	8.228	53.059
3	.832	6.936	59.995
4	.768	6.396	66.391
5	.688	5.732	72.123
6	.623	5.191	77.314
7	.569	4.741	82.055
8	.500	4.169	86.223
9	.490	4.086	90.309
10	.460	3.830	94.139
11	.393	3.278	97.417
12	.310	2.583	100.000

Table 5 - Summary of Measured Steps

Scale Point	Frequency	Percent	Observed Average*	Sample Expectation	Step Calibration	Score
1 Not Used	3426	9	-11.3	-11.5	None	-28.72
2 Infrequently Used	7060	19	-5.2	-4.9	-15.3	-12.65
3 Moderately Used	11445	30	.8	.8	-6.85	-.53
4 Often Used	10206	27	7.1	6.9	4.96	12.45
5 Extensively Used	5302	14	14.9	15.0	17.19	29.99

*AVERAGE is the mean of measures for the scale point.

Table 6a – Infit and outfit mean squares for raters

	Raw Score	Model Measure	Infit MS	Outfit MS
Mean	37.9	52.29	1.01	1.02
SD	8.8	10.32	.67	.68

Table 6b – Infit and outfit mean squares for items

	Raw Score	Model Measure	Infit MS	Outfit MS
Mean	9934.6	50.00	1.00	1.02
SD	1002.2	4.32	.28	.29

Table 7 – Latent trait model measure for each of the 12 items

Item	Model Measure
minhaznd	42.6
comput	43.3
goal	47.4
team	47.9
train	48.6
qualimp	49.8
immprod	50.3
conimp	50.9
lean	52.4
decision	53.1
futskil	55.9
feedbk	57.8

Table 8 – Means, standard deviations and sample sizes for selected demographic variables.

Union	Gender	Race	Mean	SD	N
Union	Female	Other	33.26	9.1585	90
		White	31.33	8.0012	552
	Male	Other	35.59	9.1294	32
		White	31.41	8.5753	114
Non-Union	Female	Other	35.44	9.1671	285
		White	34.85	7.8247	1372
	Male	Other	36.81	9.3101	124
		White	35.94	8.4203	461

Table 9 – ANOVA for gender, union membership and race coded as white and other.

Source	Sum of Squares	df	Mean Square	F	Sig.
Union	1941.677	1	1941.677	28.663	.000
Gender	353.940	1	353.940	5.225	.022
Race	846.501	1	846.501	12.496	.000
Union * Gender	.003261	1	.003.261	.000	.982
Union * Race	321.656	1	321.656	4.748	.029
Gender * Race	95.271	1	95.271	1.406	.236
Union * Gender * Race	58.185	1	58.185	.859	.354
Error	204714.502	3022	67.741		
Total	3786826.000	3030			

Table 10 – Means, standard deviations and sample sizes for the sum of the key activity ratings for each concentration

High Performance		PROD	QA	MPPD	LIC	HSEA	MIR
Low	**Mean**	114.5122	98.4228	132.5429	99.2553	138.0685	119.5726
	N	123	123	70	47	73	117
	SD	20.1195	16.2506	23.4111	22.6826	30.3820	20.5968
High	**Mean**	126.9462	109.5680	144.7872	106.8000	154.3415	128.7059
	N	223	206	94	70	164	153
	SD	15.1404	12.5963	19.2443	17.3369	19.5682	18.3328

Table 11 – Means, standard deviations and samples sizes for each critical work function.

	N	Mean	SD
CWFX1	1175	29.1498	4.9848
CWFX2	1400	15.6471	3.2196
CWFX3	1466	15.7135	3.4268
CWFX4	1068	23.8614	4.5512
CWFX5	1618	15.9425	3.1976
CWFX6	1113	19.5580	3.7188
CWFX7	712	19.1025	4.6266
CWFX8	722	20.2673	4.2340
CWFX9	693	19.5772	4.2737
CWFX10	580	28.3741	5.3399
CWFX11	640	19.1672	4.1609
CWFX12	899	15.9299	3.3431
CWFX13	626	19.1486	4.1901
CWFX14	482	15.5456	3.5246
CWFX15	470	31.0404	6.8754
CWFX16	514	15.2685	3.5141
CWFX17	562	15.9964	3.5899
CWFX18	676	15.7456	3.4190
CWFX19	991	7.8073	1.8771
CWFX20	690	19.4362	3.8985
CWFX21	861	19.0604	4.2014
CWFX22	797	18.7327	4.4451
CWFX23	1508	16.4397	3.0866
CWFX24	999	23.3744	5.0750
CWFX25	710	22.9620	5.0285
CWFX26	623	27.3098	5.5265
CWFX27	593	29.7690	6.7091
CWFX28	1095	19.6584	3.8222
CWFX29	909	18.9450	4.0865
CWFX30	1090	20.8000	3.7356
CWFX31	398	18.1759	4.2868
CWFX32	926	16.5745	3.0932
CWFX33	1136	16.2447	3.2960
CWFX34	1170	23.7462	4.7320
CWFX35	1048	27.2433	5.1781
CWFX36	953	18.7933	3.7579

Table 12 – Means, standard deviations and samples sizes for high and low groups for each critical work function.

High Performance	Low			High		
	Mean	**N**	**SD**	**Mean**	**N**	**SD**
CWFX1	27.62	496	5.2786	30.28	670	4.4173
CWFX2	14.90	649	3.4422	16.29	745	2.8646
CWFX3	14.60	618	3.7120	16.51	840	2.9593
CWFX4	22.72	468	4.8414	24.73	595	4.1064
CWFX5	15.07	698	3.4089	16.61	911	2.8602
CWFX6	18.46	448	4.0894	20.28	659	3.2550
CWFX7	18.00	261	4.8954	19.74	445	4.3534
CWFX8	19.05	263	4.5265	20.94	453	3.9065
CWFX9	17.95	237	4.6562	20.42	449	3.7808
CWFX10	26.57	211	5.9744	29.39	363	4.6682
CWFX11	18.00	229	4.2915	19.84	404	3.9502
CWFX12	14.77	349	3.6026	16.65	540	2.9533
CWFX13	17.57	225	4.4796	20.04	396	3.7586
CWFX14	15.22	200	3.6718	15.78	278	3.4251
CWFX15	30.03	189	7.4932	31.75	277	6.3787
CWFX16	14.46	202	3.7165	15.79	308	3.2932
CWFX17	15.32	238	3.8683	16.52	319	3.2658
CWFX18	15.09	281	3.7204	16.24	389	3.1113
CWFX19	7.56	448	1.9662	8.01	537	1.7740
CWFX20	18.57	310	4.0823	20.14	374	3.5518
CWFX21	18.12	376	4.2872	19.78	479	3.9953
CWFX22	17.60	361	4.6573	19.65	429	4.0205
CWFX23	15.56	666	3.3349	17.13	831	2.6902
CWFX24	22.37	467	5.4719	24.25	525	4.5371
CWFX25	22.12	326	5.0468	23.64	379	4.9265
CWFX26	26.28	252	5.6951	28.00	367	5.3321
CWFX27	28.37	257	7.0932	30.80	331	6.2239
CWFX28	18.63	446	4.0748	20.34	642	3.4805
CWFX29	17.93	381	4.3463	19.66	521	3.7416
CWFX30	19.60	434	3.9999	21.59	649	3.3329
CWFX31	17.13	158	4.4865	18.85	235	4.0466
CWFX32	15.95	414	3.3494	17.08	507	2.7777
CWFX33	15.58	491	3.5066	16.74	641	3.0404
CWFX34	22.62	513	5.2866	24.62	650	4.0612
CWFX35	25.79	430	5.4173	28.26	612	4.7660
CWFX36	17.46	336	3.8909	19.51	612	3.4846

Table 13 – Pearson correlations between the high performance workplace score and sum of key activities for each critical work function.

Critical Work Functions

	CWFX1	CWFX2	CWFX3	CWFX4	CWFX5	CWFX6	CWFX7	CWFX8	CWFX9	CWFX10
Corr	.311	.272	.343	.271	.310	.287	.256	.261	.321	.300
Sig.	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
N	1166	1394	1458	1063	1609	1107	706	716	686	574
	CWFX11	CWFX12	CWFX13	CWFX14	CWFX15	CWFX16	CWFX17	CWFX18	CWFX19	CWFX20
Corr	.263	.301	.321	.177	.244	.318	.248	.252	.184	.232
Sig.	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
N	826	1184	930	840	962	796	1117	1088	1109	1081
	CWFX21	CWFX22	CWFX23	CWFX24	CWFX25	CWFX26	CWFX27	CWFX28	CWFX29	CWFX30
Corr	.238	.286	.277	.218	.234	.223	.252	.312	.253	.260
Sig.	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000
N	855	790	1497	922	705	619	588	1088	902	1083

	CWFX31	CWFX32	CWFX33	CWFX34	CWFX35	CWFX36
Corr	.261	.214	.208	.257	.319	.352
Sig.	.	.000	.000	.000	.000	.000
N	393	921	1132	1163	1042	948

Table 14 – Pearson correlations between the high performance workplace score and sum of key activities for each concentration.

	PROD	QA	MPPD	LIC	HSEA	MIR
Corr	.425	.429	.339	.350	.332	.327
Sig.	.000	.000	.000	.000	.000	.000
N	346	329	164	117	237	270

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