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# Differences between Job Roles in the Specialty Trades: A Human Factors Approach

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The construction industry is an industry that relies heavily on labor and skilled personnel. While workforce shortage is currently increasing due to current market conditions and shifting demographics. Innovative human resource management practices, such as the use of human factor measurements should be developed to overcome the current and future challenges. The study developed a Human Factor (HF) instrument with three components: personality inventory, emotional intelligence, and behavioral measurement. 182 participants within four job roles Project Managers (PMs), Field Leaders (FLs), Estimators (ESTs), and Detailers (VDCs) from the sheet and metal contractors have taken the HF instrument. Comparison results showed that the four job roles have several differences in HF, including FLs had higher Modesty than PMs; FLs had lower Openness to Experience than VDCs; FLs had higher Greed-Avoidance, lower Fairness, and lower Inquisitiveness than ESTs; PMs had higher Dependence, higher Sentimentality, and lower Creativity than VDCs; PMs had lower Prudence than ESTs, and there were no statistically significant differences between VDCs and ESTs. These results can help contractors hire, develop, and maintain talent in their organizations. Given the limited number of participants, future research is recommended to expand the data pool to other specialty trades across the construction industry.

**Key Words:** Human Factors, specialty trades, emotional intelligence, personality characteristics, Human Resource Management (HRM).

## Introduction

Human resource management is an essential factor in the overall performance of any organization (Delaney and Huselid 1996; Ericksen and Dyer 2005). Within the construction industry, there are a lot of Human Resource management issues that the literature has given insufficient attention to (Raidén et al. 2001; Tabassi and Bakar 2009). The construction industry is a labor-intensive industry. It is currently suffering from fewer available human resources to fill up job vacancies due to current market conditions and shifting demographics (Wiesel et al. 2016). due to this, new tools and practices should be studied to support the human resource management practices in the construction industry.

The objective of this study was to identify the human factors (personality, emotional intelligence, and behavioral traits) of individuals who perform different job roles within the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) contractors, including Project Managers (PMs), Field Leaders (FLs), Estimators (ESTs), and Detailers (VDCs).

To identify the human factors, the study created human factors (HF) instrument, which is a composite of three well developed and reliable assessments including, HEXACO personality inventory (a measurement of personality), QDiSC behavioral instrument (a measure of behavioral response), and Emotional Intelligence Quotient (a measurement of emotionality). Understanding the differences between roles is helpful in scenarios when an employee is transitioning between roles or being promoted to another role. It is also beneficial when interviewing new candidates who may be qualified "on paper" because the company might be more likely to find the best "fit" candidate based on the needs of the job role. In addition, evaluating differences in personality traits for different job roles provides valuable information when employees transition from one role to another. For example, consider a field leader moving into a detailer position (e.g., perhaps in a situation where the company is advancing an individual with valuable tradecraft knowledge and first-hand field experience into their BIM/VDC/Detailer group). If significant HF differences exist between the FL and VDC roles, then taking an HF assessment can help identify traits that should be considered when employees transition between these roles. For example, some FLs may have HF traits that are "good fits" for the VDC role; in these cases, there might be a greater probability of a successful transition. In other instances, FLs may not be as good of a "fit" for a VDC position, so guidance on specific areas they can work on would be helpful.

## Literature Review

Many techniques and methods have been formed to assist talent development of employees. The importance of human resource management (HRM) to organizational performance was explained by previous studies (Delaney and Huselid 1996; Ericksen and Dyer 2005). However, little has addressed the project-based industries' specific settings and challenges. Furthermore, very little has sought to capture practical approaches within the construction sector or examine how these activities could be adapted and implemented to improve the performance and job satisfaction of the industry's workforce (Loosemore et al. 2003; Maali et al. 2020).

Previous researchers have noted that the construction industry literature is significantly limited regarding human resource management issues, despite that the construction industry is one of the most labor-intensive industries (Raidén et al. 2001; Tabassi and Bakar 2009). The need for young talent in the construction industry is noticeably rising throughout the years, and the pool of new talent is shrinking due to shifting demographics and other constraints. In addition, most project leaders within the industry will leave for retirement in the next handful of years, and companies are faced with challenges to fill up those job vacancies with new, qualified professionals (Wiezel et al. 2016).

This generates a need to develop and research new human resource management practices within the construction industry (Druker and White 1996). The use of new HRM practices in the construction industry, such as using personality profile assessments, was analyzed by Childs et al. (2017), who found some basic purposes of using such personality profile assessments for hiring, leadership development, promotions, and team placement.

Other industries have begun using human factors for other purposes such as reducing employee turnover, hiring, promoting, team building, and or leadership development in the health care industry (Johnson et al. 2011), tourism industry (Sohn and Lee 2012), or in general (Žiaran 2015). Several studies have analyzed the link between personality assessments and different construction activities in the construction industry. For example, different personality traits of project managers can have a different impact on project managers' perception of risk tendency (Wang et al. 2016), career development Madter et al. (2012), and project success Carr et al. (2002), or impacts of employee behavioral response to change initiatives on change outcomes (Maali et al. 2021) reaction These studies showed that personality measures are widely used in many industries.

The literature review of human factor assessments (HF) revealed multiple related assessments. However, based on the literature review, the study selected three well-developed and reliable assessments; HEXACO personality inventory (to measure personality), QDiSC-101 behavioral instrument (to measure behavioral response), and Emotional Intelligence Quotient (to measure emotionality). The HEXACO personality inventory was developed by Ashton and Lee (2009) is one of the most reliable assessments of personality inventories Gao et al. (2020). the HEXACO Personality Inventory assesses 6 different personality dimensions: Honesty-Humility (H), Emotionality (E), Extraversion (X), Agreeableness (A), Conscientiousness (C), and Openness (O).

The QDisc-101 Behavioral Assessment used in this study was developed by Dr. Avi Wiezel, who derived it from the four-quadrant behavior diagnostic tool from Jones & Hartley (2013). Studies have shown that using this tool improves office relationships (Scarbecz 2007) as a predictor of employee retention and job success (Deviney et. al. 2010). The tool provides information about behavior priorities and preferences at the workplace by assigning participants to one of the four quadrants (Dominant - D, Inspiring - I, Supportive - S, and Cautious – C by providing scores of work orientation (task vs. people) and communication style (reserved vs. assertive).

The Emotional Intelligence Quotient (EQ) by TalentSmart (2011) provides scores measured on a scale of 1 to 100 for overall emotional intelligence and other four emotional skills, including self-awareness, self-management, social awareness, and social management. This assessment was validated across many industries and job functions (Sunindijo and Hadikusumo 2014).

## **Methodology**

### *Research Objective*

The research objective was to identify differences in HF scores between each of the four job roles of SMACNA participants. Understanding the differences between roles is helpful in scenarios when an employee is transitioning between roles or being promoted to another role. It is also beneficial when interviewing new candidates who may be qualified “on paper” because the company might be more likely to find the best “fit” candidate based on the needs of the job role.

The first research objective was accomplished by reviewing the results of the human factors assessment for all participants in each job role. The results for each job role were analyzed to find statistically significant differences. The Human Factors Assessment section of this paper describes the human factors assessment in greater detail. This paper's Results and Discussion section describes the differences in each combination of job roles (FL vs. PM, FL vs. VDC, FL vs. EST, PM vs. VDC, PM vs. EST, and EST vs. VDC). Several takeaways are recommended based on the specific differences found between the roles. A pilot study was commissioned by the New Horizons Foundation (NHF) on

behalf of the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) to achieve research objectives.

### *Data Collection*

A total of 182 participants from 10 companies across the country volunteered to complete the HF Assessment. The participants were from four job roles Project Managers (PMs), Field Leaders (FLs), Estimators (ESTs), and Detailers (VDCs). Table 1 shows the count of participants by their job role.

Table 1

*Number of participants by Job Role*

Job Role Participants	Number of practitioners
Project Managers (PMs)	42
Field Leaders (FLs)	88
Estimators (ESTs)	25
Detailers (VDCs)	27
TOTAL	182

The following job role descriptions were used in this study; *Project Managers (PMs)*: Responsible for the contract administration and performance of awarded projects and marketing the company's services. *Field Leaders (FLs)*: Drives field outcomes in labor production, quality control, and resource management to consistently deliver strong results in areas where they have control. Works closely with the PM to ensure timely delivery of tools, information, and material to support production. Note: the FL role included volunteers that typically had one of the following job titles: foreman, general foreman, superintendent, field executive, or a similar job title. *Estimators (ESTs)*: Responsible for coordinating the mechanical and HVAC bid process by leading the preparation and assembly of major estimate items. *Detailers (VDCs)*: Responsible for the layout of HVAC and mechanical items (ductwork, piping, plumbing, equipment, controls, etc.) by creating a constructible model. It is noted that all data collection took place during Fall 2020, amid the COVID-19 pandemic, which may have impacted the number of responses.

### *Human Factors Assessment*

Participants completed the human factors (HF) instrument, which includes a composite of three assessments, including HEXACO personality inventory (a measure of personality), QDiSC-101 behavioral instrument (a measure of behavioral response), and Emotional Intelligence Quotient (a measurement of emotionality).

#### *HEXACO Personality Inventory*

There are domains and sub-domains of the HEXACO personality inventory. *Honesty-Humility (H)*: contains the sub-domains of Sincerity, Fairness, Greed Avoidance, and Modesty. Typical personality descriptors include sincere, honest, faithful, loyal, modest/unassuming *versus* sly, deceitful, greedy, pretentious, hypocritical, boastful, pompous. *Emotionality (E)*: contains the sub-domains of Fearfulness, Anxiety, Dependence, and Sentimentality. Personality descriptors include emotional, oversensitive, sentimental, fearful, anxious, vulnerable *versus* brave, tough, independent, self-assured,

stable. *Extraversion (X)*: contains the sub-domains of Social Self-Esteem, Social Boldness, Sociability, and Liveliness. Personality-descriptors include outgoing, lively, extraverted, sociable, talkative, cheerful, active *versus* shy, passive, withdrawn, introverted, quiet, reserved. *Agreeableness (A)*: contains the sub-domains of Forgiveness, Gentleness, Flexibility, and Patience. Personality-descriptors include patient, tolerant, peaceful, mild, agreeable, lenient, gentle *versus* ill-tempered, quarrelsome, stubborn, choleric. *Conscientiousness (C)*: contains the sub-domains of Organization, Diligence, Perfectionism, and Prudence. Personality descriptors include organized, disciplined, diligent, careful, thorough, precise *versus* sloppy, negligent, reckless, lazy, irresponsible, absent-minded. *Openness (O)*: contains the sub-domains of Aesthetic Appreciation, Inquisitiveness, Creativity, and Unconventionality. Personality-descriptors include intellectual, creative, unconventional, innovative, ironic *versus* shallow, unimaginative, conventional. Each domain and subdomain are measured on a scale of 1 to 4. However, higher scores are not necessarily better or worse when compared to lower scores. It instead represents a score on a spectrum (ranging from the low to the high side) of any personality domain or subdomain.

#### *Emotional Intelligence Diagnostic*

This instrument measures four emotional skills. *Self-Awareness*: the ability to understand your emotions as they happen. *Self-Management*: the ability to control your emotional reactions. *Social Awareness*: the ability to understand other people's emotions (even if you do not share the same feelings). *Social Management*: the ability to use emotional awareness to create more successful interactions. In addition to the overall Emotional Intelligence score, all emotional skills are measured on a scale of 1 to 100.

#### *QDisc-101 Behavioral Assessment*

This instrument measures four behavior types. *Dominance (D)*: associated with control, power, and assertiveness. Actions are focused on accomplishing results. Individuals with high D scores are perceived as demanding, determined, and pioneering. *Influence (I)*: associated with social interaction skills and communication. Actions are focused on building relationships and persuading others. Individuals with a high I score are perceived as convincing, magnetic, and optimistic. *Steadiness (S)*: associated with patience, resilience, and thoughtfulness. Actions are focused on compliance and cooperation. Individuals with high S scores are perceived as calm, stable, and unemotional. *Compliance/Conscientious (C)*: associated with structure and organization. Individuals with high C scores are perceived as cautious, precise, and tactful. The above-listed behavior types in DISC are determined by two sub-scales; *Work Orientation*: rated on a scale ranging from -4 to 4 (-4= task-oriented; 4 = people-oriented), and *Communication Style*: rated on a scale ranging from -4 to 4 (-4= reserved communication; 4 = open-style communication).

## **Method of Analysis**

Data analysis was performed in three steps. First, the Kruskal-Wallis H test was used to determine whether there were any differences in the HF scores between the four job roles. Second, post hoc tests using Dunn's (1964) procedure with a Bonferroni correction were performed for multiple comparisons between the four job roles. Finally, Descriptive analysis of and percentage difference of significant results were performed to present and better interpret the results.

## Results & Discussion

The Kruskal-Wallis H test was conducted to determine differences in the HF assessment scores between the four job roles. Visual inspections of boxplots between the four job roles across all HF instrument scores were similar. Table 2 list 11 HF scores that had significant ( $p < .05$ ) Kruskal-Wallis H test results (median HF score was statistically significantly different between groups of job role) and the corresponding results of post hoc test results.

Table 2

*Post Hoc test results of significant different HF scores*

HF Assessment	Post-Hoc Test Result (pairwise comparison)
Fairness	Significant between FLs and PMs, and between FLs and ESTs
Greed-Avoidance	Significant between FLs and ESTs
Modesty	Significant between FLs and PMs
Dependence	Significant between PMs and VDCs
Sentimentality	Significant between PMs and VDCs
Prudence	Significant between PMs and ESTs
Openness	Significant between FLs and VDCs
Aesthetic Appreciation	Significant between FLs and VDCs
Inquisitiveness	Significant between FLs and ESTs
Creativity	Significant between PMs and VDCs
Unconventionality	Significant between FLs and VDCs

### *Overall Differences across the Human Factors Assessment*

There were no significant differences between the roles at the overall emotional quotient level or within any of the sub-skills for the Emotional Intelligence Diagnostic. For the Q-DISC 101 Behavioral Assessment, there were no significant differences between the roles for communication style and work orientation. However, for the HEXACO Personality Inventory, there were several significant differences ( $P < .05$ ) between the four job roles at the domain level (e.g., H, E, X, A, C, O scores) and at the sub-domain. These differences are described below.

### *Specific Differences between the Four Job Roles*

Each combination of job role pairings is described below to highlight the statistically significant differences. Discussion of specific meaning for each pairing is also included to provide practical guidance on how the industry may apply the results.

#### *Field Leaders (FLs) vs. Project Managers (PMs)*

There was only one difference between FLs and PMs in a single area of the Honesty-Humility domain. On average, FLs had Higher Modesty (+11%) than PMs, which means FLs tend not to consider themselves superior to others or entitled to privileges that others do not have. Instead, they see themselves as ordinary team members to a greater extent than PMs. Conversely, PMs tend to recognize their role in overseeing the project's well-being. Although there were minimal HF

differences, companies should monitor instances where a FL transitions to the PM role and ensure the individual is willing to take on the different perspectives and responsibilities of the position.

*Field Leaders (FLs) vs. Detailers (VDCs)*

There were three differences between FLs and VDCs, all in the same domain. On average, FLs tended to have Lower Openness to Experience (−9%) than VDCs, including Lower Unconventionality (which corresponds with FLs tending to stick with “tried-and-true” ideas and avoid unconventional, radical, or unusual ideas to a greater extent than VDCs) and Lower Aesthetic Appreciation (which means FLs tend to see beauty in simplicity and typically prefer simple solutions over complex ones). This means that if a FL is transitioning to a VDC role, they should be encouraged to use their field expertise to think “outside-the-box” in their new role more than they might be accustomed to. For example, FLs who are great problem-solvers are likely candidates to successfully build on this strength when transitioning to a VDC role. It should be noted that at least one company that participated in this study also has tested for visual-spatial skills when moving individuals from the field into a BIM/VDC/Detailer role. The purpose of this test is to understand the individual’s ability to “see” in 3-dimensions and work in model space.

*Field Leaders (FLs) vs. Estimators (ESTs)*

There were three differences between these roles in different sub-domains; (1) On average, FLs had Higher Greed-Avoidance (+10%) than ESTs, which means FLs tend to be relatively less motivated by social-status considerations, (2) FLs had Lower Fairness (−7%) than ESTs, which means that ESTs are scrupulous about not bending the rules, and (3) FLs had Lower Inquisitiveness (−12%) than ESTs, which means FLs are focused on getting work done quickly and have less curiosity about stopping to uncover why things are the way they are. The opposing differences in Greed-Avoidance and Fairness seem to balance out, especially since both are part of the Honesty-Humility (H) domain. Moreover, the lower Inquisitiveness of FLs seems reasonable given their role of leading the production in the field.

*Project Managers (PMs) vs. Detailers (VDCs)*

There were three differences between PMs and VDCs. Two of these differences were in the Emotionality (E) domain and the third was in the Openness to Experience (O) domain; (1) On average, PMs had Higher Dependence (+29%) than VDCs, which corresponds with a solid ability to identify difficulties or challenges and share that information with others who can provide helpful feedback and collaboration. (2) PMs had Higher Sentimentality (+15%) than VDCs, which means that VDCs tend to rely less on emotional intuition and personal relationships when making business decisions. And (3) PMs had Lower Creativity (−14%) than VDCs, which corresponds with a greater tendency to stick to what works as the “tried-and-true” is their preferred way forward. PMs of course still have problem-solving skills but typically will not rock the boat by trying to solve problems in a new, different, or experimental way. This means that PMs who have shown creativity, innovativeness, and ability to “think-outside-the-box” may be more successful candidates transitioning to a VDC role. Conversely, VDCs who show strong relationship-building skills may have a greater likelihood of success in moving to a PM role.

*Project Managers (PMs) vs. Estimators (ESTs)*

There was only one difference in a sub-area of the Conscientiousness (C) domain. On average, PMs had Lower Prudence (−7%) than ESTs. This means that ESTs are less likely to act on impulse and

tend to be cautious and carefully consider their options. PMs, conversely, are better equipped to act on a “gut-feeling” without needing to pause to analyze the possible consequences. This means that PMs who transition into a full-time EST role may be more successful if they have a history of being cautious, non-impulsive, and highly measured in their actions compared with their peers. ESTs who move to a PM role may be encouraged to act decisively and prudently in the project's best interest, given the number of stakeholders who may be awaiting their input. Yet overall, it is not surprising to see minimal differences between PMs and ESTs, given that PMs often have substantial estimating responsibility (such as providing input on bids or when handling change orders)

#### *Detailers (VDCs) vs. Estimators (ESTs)*

There were no differences among the 37 human factors characteristics used in this study. This could be due to the relatively smaller sample sizes collected for VDCs and ESTs. Gaining additional participation in the future may reveal differences between these roles.

### **Conclusion**

There were differences in HF characteristics between all job roles (except EST vs. VDC, which may be due to the smaller sample sizes in these two roles). The information obtained from the human factors HF instrument is helpful for contractors who are evaluating: (1) New-hire candidates, where the candidate can be asked interview questions that explore their “fit” for the distinctive traits of the job role they are interviewing for. (2) Current employees who are transitioning between roles (moving from FL to PM, for example): the employee can better understand their “match” or “fit” for the new job role and can be coached to develop the strengths that will be most helpful in performing the new role. Given that this study was conducted at a pilot scale with a limited number of participants, future research is recommended to expand the data pool and investigate distinguishing characteristics between the four job roles and other additional roles.

### **References**

- Ashton, M. C., & Lee, K. (2009). The HEXACO-60: A short measure of the major dimensions of personality. *Journal of Personality Assessment*, 91, 340-345.
- Carr, P. G., De La Garza, J. M., and Vorster, M. C. (2002). “Relationship between Personality Traits and Performance for Engineering and Architectural Professionals Providing Design Services.” *Journal of Management in Engineering*, 18(4), 158-166.
- Childs, B., Weidman, J., Farnsworth, C., & Christofferson, J. (2017). "Use of Personality Profile Assessments in the U.S. Commercial Construction Industry." *ASC International Journal of Construction Education and Research*, 13(4), 267-283.
- Delaney, J. T., and Huselid, M. A. (1996). “The Impact of Human Resource Management Practices on Perceptions of Organizational Performance.” *Academy of Management Journal*, 39(4), 949-969.
- Deviney, D., Mills, L. H., and Gerlich, R. N. (2010). “Environmental Impacts on GPA For Accelerated Schools: A Values and Behavioral Approach.” *Journal of Instructional Pedagogies*, 3.
- Druker, J., White, G., Hegewisch, A., and Mayne, L. (1996). “Between Hard and Soft HRM: Human Resource Management in the Construction Industry.” *Construction Management & Economics*, 14(5), 405-416.



- Dunn, O. J. (1964). "Multiple comparisons using rank sums." *Technometrics*, 6(3): 241-252.
- Erickson, J., and Dyer, L. (2005). "Toward a Strategic Human Resource Management Model of High Reliability Organization Performance." *The International Journal of Human Resource Management*, 16(6), 907-928.
- Gao, Y., González, V. A., and Yiu, T. W. (2020). "Exploring the Relationship between Construction Workers' Personality Traits and Safety Behavior." *Journal of Construction Engineering and Management*, 146(3).
- Johnson, M. K., Rowatt, W. C., and Petrini, L. (2011). "A New Trait on the Market: Honesty–Humility as a Unique Predictor of Job Performance Ratings." *Personality and Individual Differences*, 50(6), 857-862.
- Jones, C.S. and Hartley, N.T. (2013) "Comparing Correlations Between Four-Quadrant And Five-Factor Personality Assessments" *American Journal of Business Education*, July/August 2013, Vol 6, No. 4, pp. 459 – 470.
- Loosemore, M., Dainty, A., and Lingard, H. (2003). *Human Resource Management in Construction Projects: Strategic and Operational Approaches*. Taylor & Francis Group.
- Maali, O., Lines, B., Smithwick, J., Hurtado, K., & Sullivan, K. (2020). "Change management practices for adopting new technologies in the design and construction industry". *Journal of Information Technology in Construction*, 25, 325-341.
- Maali, O., Shalwani, A., Lines, B., Sullivan, K., & Perrenoud, A. (2021). A Spectrum of Employee Reactions to the Adoption of Organizational Changes in the AEC Industry. *EPiC Series in Built Environment*, 2, 91-99.
- Madter, N., Bower, D. A., and Aritua, B. (2012). "Projects and Personalities: A Framework for Individualising Project Management Career Development in the Construction Industry." *International Journal of Project Management*, 30(3), 273-281.
- Raidén, A. B., and Dainty, A. R. (2006). "Human Resource Development in Construction Organisations." *The Learning Organization*.
- Scarbecz, M. (2007). "Using the DISC System to Motivate Dental Patients." *The Journal of the American Dental Association*, 138(3), 381-385.
- Sohn, H. K., and Lee, T. J. (2012). "Relationship Between HEXACO Personality Factors and Emotional Labour of Service Providers in the Tourism Industry." *Tourism Management*, 33(1), 116-125.
- Sunindijo, R. Y., and Hadikusumo, B. H. (2014). "Emotional Intelligence for Managing Conflicts in the Sociocultural Norms of the Thai Construction Industry." *Journal of Management in Engineering*, 30(6).
- Tabassi, A. A., and Bakar, A. A. (2009). Training, motivation, and performance: The case of human resource management in construction projects in Mashhad, Iran. *International Journal of Project Management*, 27(5), 471-480.
- TalentSmart (2011). *Emotional Intelligence Appraisal Teaching Manual*. San Diego, CA:TalentSmart.
- Wang, C. M., Xu, B. B., Zhang, S. J., and Chen, Y. Q. (2016). "Influence of Personality and Risk Propensity on Risk Perception of Chinese Construction Project Managers." *International Journal of Project Management*, 34(7), 1294-1304.
- Wiesel, A., Sullivan, K., Gunnoe, J., and Perrenoud, A. (2016). "Best Practices for Project Manager Succession." CII Research Report 325-1. *Construction Industry Institute*.
- Žiaran, P. (2015). "Humility and Self-Esteem as Key Predictors of Ethical Attitude in Leadership." *Procedia Economics and Finance*, 34, 689-696.