

Job characteristics and employee well-being: a test of Warr's vitamin model in German horticulture

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Abstract

Personnel costs account for 40% of all expenses in German horticulture. The importance of human resource management and leadership is growing through demographic change and social sustainability issues. The aim of this study was to investigate the relationships between job characteristics and employee well-being and their utility function in German horticulture. An investigation was conducted with a paper-and-pencil and web-based questionnaire, using a modified Kunin-scale. Responses from 145 employees from different businesses were analysed. This study supports the assertion of Warr's vitamin model that non-linear relationships exist between job characteristics and employee well-being. A linear regression of job satisfaction on 28 job features attained a remarkable R^2 of .627. The highest correlations were found with items measuring good future prospects, an organization's morality in society, significance to self, work-home conflict and the availability of adequate equipment. This identifies the potential to increase employee well-being and social sustainability, and demonstrates that the indicator of employee subjective well-being is a valuable indicator for measuring social sustainability. Most notably, non-linear evaluations of job features are superior to the assumption of linearity.

Keywords: job satisfaction, social sustainability, human resources management

INTRODUCTION

Personnel costs account for approximately 40% of all expenses in German horticulture (own calculation based on the Center for Business Mgt. in Hort. and Applied Research data from 2012). People-focused topics are forecast to be initiators for fundamental business transformations in German companies for the next two decades (Claßen and von Kyaw, 2007) and to be a key issue for the future success of horticulture in Germany (Schreiner et al., 2013).

Subjective well-being can be measured context-free as life satisfaction, context-based as, for example, job satisfaction (a facet of employee well-being) and facet-specific, for instance, as satisfaction with payment. Employee subjective well-being can be seen as an indicator for social sustainability (Meyerding, 2014a) and measuring this supports companies by providing valuable information to cope with changes in their business environment (Meyerding, 2014b).

There are different approaches regarding how to think about and measure psychological well-being at work (see Eid and Larsen, 2008). If job satisfaction is measured through a variety of facets the decision as to which facets are included in the evaluation model is critical, in particular whether environmental features alone or additional personal characteristics should be examined (Warr, 2012, 2013).

One way of evaluating job satisfaction is by using Herzberg's Two-Factor model (Herzberg et al., 1959). For example, Bitsch and Hogberg (2005) used parts of the Herzberg model for a qualitative study of US horticulture with 31 interviews. More recently, Reiche and Sparke (2012) performed a quantitative study among 446 vocational school and technical college students in Germany, partly based on Herzberg's model, but with an innovative analytical approach.

Although there is some research about employee well-being in German horticulture, it



is based on Herzberg's et al. (1959) model, which is common in business management research and human resources literature, but this is not state-of-the-art in psychology and has almost no empirical backing (von Rosenstiel et al., 2000). To the author's knowledge, there is no quantitative research in the field of German horticulture which examines the nature of employee well-being and reports the impact of different job facets on job satisfaction. Furthermore, the shape of the utility function of these job attributes is also unknown in German horticulture. It is assumed that the utility functions are not linear (Warr, 1987), but empirical evidence for non-linearity is still lacking.

This paper presents a quantitative study that examines the relationship between 28 job attributes, employee well-being and life satisfaction in German horticulture. The theoretical background and the methodology of the study is based on Warr's latest version of the Vitamin model (Warr, 2007) which provides 12 job features (vitamins) and their hypothetical utility function.

MATERIALS AND METHODS

To examine the relationship between different job attributes and employee well-being, a questionnaire was carried out among employees of various German horticulture companies. The questionnaire was designed and implemented in both a paper-based and web-based format to ensure as many different distribution channels as possible, whilst allowing flexibility to include different groups of participants.

The theoretical background of the study was Warr's Vitamin model (Warr, 2007) which describes two different types of utility functions. The first type presents an inverse U-shape (additional decrement), and is seen mostly in intrinsic job features like job autonomy. At low levels of these features the satisfaction (context-based and/or context-free) is also low and increases as the level of the feature increases. However, after a moderate level has been achieved (subjective optimum), the Vitamin becomes toxic. Further increasing the job feature leads to a decrease in well-being (Figure 1).

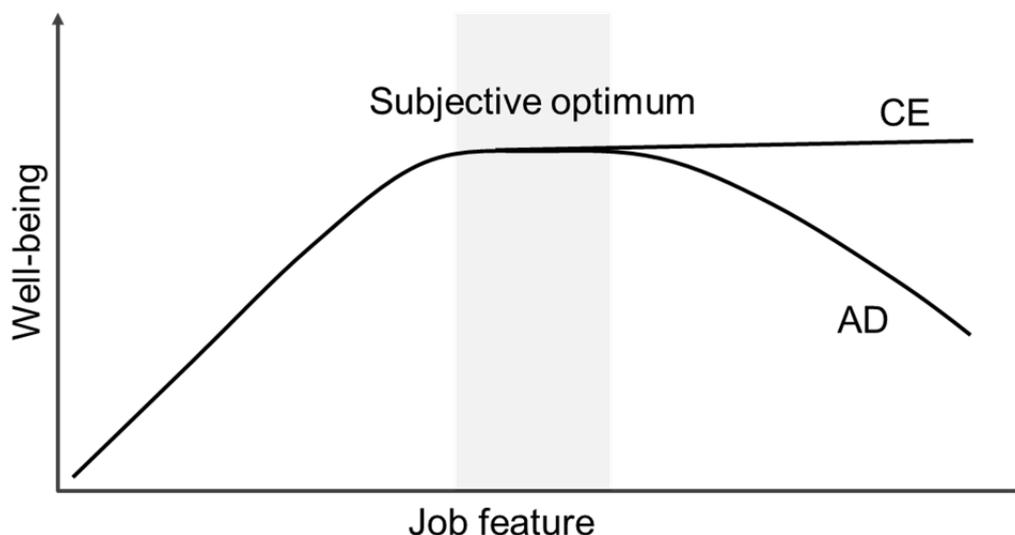


Figure 1. The vitamin analogy: proposed additional decrement (AD) and constant effect (CE) relationships between job features and well-being (own illustration: cf. Warr, 2013).

The second form of utility function tends to apply to extrinsic job features, such as payment. At low levels of these features, well-being is also low and increases as the level of the feature does. However, after a moderate level (subjective optimum) the marginal utility decreases (constant effect). These Vitamins do not become toxic at very high values, but

their effect on subjective well-being becomes very small, almost zero.

The present study contains 28 job features (job aspects), which can be assigned to Warr's 12 vitamins (Meyerding, 2014a). In addition, measures of overall subjective job satisfaction and life satisfaction were collected.

The questionnaire consisted of four sections. The first section asked employees about their dream job and the importance of all 28 job features. The second section asked about the characteristics of their current job. Participants were requested to evaluate these features based on the past four weeks. To assess the features, a modified Kunin-scale (Kunin, 1955) was used to make it easier for the participants to grasp the nature of the values in question. This was necessary because the values were often assumed to be linear (more is better). Response options in this section were: 1 (extremely low); 2 (very low); 3 (quite low); 4 (about right); 5 (quite high); 6 (very high) and 7 (extremely high), for features with an additional decrement (AD) effect. For constant effect (CE) features, the following response options were given: 1 (extremely low); 2 (very low); 3 (quite low); 4 (about right); 5 (quite acceptable); 6 (very acceptable) and 7 (extremely acceptable). The third section contained characteristics of the company such as the line of business it was operating in, the number of staff employed and size of greenhouse or open field area. The last section of the questionnaire included personal demographics like gender, age and level of education.

After cognitive testing and five interviews, the questionnaire was circulated. In total, 301 employees participated in the survey. However, of these, only 145 questionnaires could be used for the analysis. The data were tested for completeness and consistency and only records with more than ten completed questions were considered in the analysis. The questionnaire was conducted between August 2013 and June 2014 so that seasonal effects were accommodated. Participants were recruited through presentations of the research study, two articles in the horticultural trade press and through social networks. Participants came from all over Germany.

The focus of the study was on environmental features: the characteristics of the job which can be most influenced by the organization. To fully understand employee well-being, it was necessary to examine personal characteristics such as age or individual judgment processes (Warr, 2013). As a large number of employees in German horticulture are seasonal workers, the questionnaire was translated into Polish and Romanian to capture representatives from this labour group.

RESULTS AND DISCUSSION

The majority of participants were from services (41%), followed by multi-line companies (12%), floriculture (11%), tree nurseries (11%), fruit farms (9%), retail horticulture (8%), vegetable farms (4%) and wholesale enterprises (4%).

Of the sample, 33% were women and 15% were self-employed. Most participants were full-time employees (80%) who had a permanent employment contract (76%). Only 7% were seasonal workers. The youngest participant was 17 and the oldest was 69 years old (average 34, standard deviation 12, N=92).

The model was tested by comparing different specifications. One specification included increasing part of the utility function values, whereas another included decreasing part of the utility function. There should be a positive correlation below the subjective optimum and a negative correlation above the optimum (Figure 1). Additionally, the CE-features were transformed so that values above the features optimum were recoded to the corresponding values of the increasing part. The correlation between the transformed variables was expected to be stronger than without the transformation. Finally, a linear regression of each feature was compared to a non-linear regression, with the non-linear regression expected to show a higher R^2 than the linear one.

From Table 1, the vast majority of job features (23 out of 28) have a significant relationship with job satisfaction. As expected, the relationships are stronger with context-based than with context-free well-being. The highest correlation coefficient was reported for future prospects and job satisfaction: (11b, $r_s = 0.64$, p (two-tailed) <0.01), followed by the organization's morality in society (12b, $r_s = 0.53$, $p < 0.01$), significance to self (9b, $r_s = 0.48$,

$p < 0.01$), less work-home conflict (3e, $r_s = 0.48$, $p < 0.01$), job security (11a, $r_s = 0.46$, $p < 0.01$) and the availability of adequate equipment (8c, $r_s = 0.45$, $p < 0.01$). Job satisfaction was highly correlated ($r_s = 0.54$, $p < 0.01$) with life satisfaction.

Table 1. Comparison of Spearman correlations (r_s) and R^2 s of the linear and non-linear regression to support the Vitamin-Model (own illustration).

Job feature	r_s with job satisfaction	r_s transformed (AD)	r_s low (AD)	r_s high (AD)	linear regression R^2	non-linear regression R^2
2b New learning (CE)	.30**	-	-	-	.110	.148
3c Task coherence (CE)	.25**	-	-	-	.068	.078
3f Emotion. dissonance (inverse) (CE)	.34**	-	-	-	.161	.196
7a Pay level (CE)	.35**	-	-	-	.140	.160
8a Pleasant environment (CE)	.39**	-	-	-	.168	.177
8b Safe work practices (CE)	.37**	-	-	-	.139	.152
8c Adequate equipment (CE)	.45**	-	-	-	.187	.190
9a Value to society (CE)	.45**	-	-	-	.218	.226
9b Significance to self (CE)	.48**	-	-	-	.209	.211
10a Supervision behave considerate (CE)	.43**	-	-	-	.236	.244
10b Supervision is supportive (CE)	.43**	-	-	-	.222	.222
11a Job security (CE)	.46**	-	-	-	.207	.206
11b Good future prospects (CE)	.64**	-	-	-	.417	.419
12a Fair treatment of employees (CE)	.40**	-	-	-	.214	.217
12b Orga.'s morality in society (CE)	.53**	-	-	-	.304	.307
3d Conflict between job demands (CE)	.37**	-	-	-	.158	.169
3e Conflict between work and home (CE)	.48**	-	-	-	.244	.249
1a Task discretion (AD)	.18	.28**	.28**	-.17	.046	.152
1b Influence over the wider orga. (AD)	.31**	.33**	.37**	-.08	.091	.126
2a Skill use (AD)	.27**	.24*	.34**	-.02	.075	.137
3a Number of job demands (AD)	-.13	.24*	.14	-.23*	.001	.073
3b Difficulty of job demands (AD)	-.01	.03	.01	-.02	.026	.057
4a Range of different tasks (AD)	.05	.21*	.21*	-.13	.014	.065
5a Future predict. (excl. j. tenure) (AD)	.10	.14	.15	-.07	.013	.020
5b Clear role requirements (AD)	.10	.21*	.25*	-.10	.015	.077
5c Availability of feedback (AD)	.14	.19	.19	-.09	.007	.036
6a Amount of social contact (AD)	.08	.13	.13	-.08	.013	.019
6b Quality of social contact (AD)	.07	.13	.13	-.08	.000	.022

**The correlation is significant at the 0.01 level (two-tailed).

*The correlation is significant at the 0.05 level (two-tailed).

The job features were also interrelated: for example, between influence on work content (1a task discretion) and conflict between tasks (3d, $r_s = 0.22$, $p < 0.05$), workload (3a, $r_s = 0.31$, $p < 0.01$), task difficulty (3b, $r_s = 0.30$, $p < 0.01$) and work-home conflict (3e, $r_s = 0.22$,

p<0.05).

A linear regression, with all job features as independent variables, was able to explain work satisfaction to a substantial extent as expressed in a remarkable R² of .627.

A further question that was investigated was whether Warr's assumed shapes of the utility functions can be supported. If this is the case then the Vitamins with an additional decrement effect should have a positive relationship with job satisfaction below the subjective optimum (see Figure 1) and a negative correlation with job satisfaction above the subjective optimum (above a moderate level of the vitamin). In addition to the correlations, linear and non-linear regressions were calculated for all job features (and job satisfaction). For the non-linear regressions, the following functional forms were fitted:

Concave with saturation limit (exponential model, CE features):

$$\text{work satisfaction} = M - a \cdot e^{-b \cdot x} \quad (1)$$

where x is the value of the job feature and $a = 1$; $b = 0.5$; $M = 10$.

Concave with downturn (quadratic model, AD features):

$$\text{work satisfaction} = a + b \cdot x - c \cdot x^2 \quad (2)$$

where x is the value of the job feature and $a = 5.6$, $b = 5.3$, $c = 10.0$.

If the underlying curves can be supported with the data from the present study, the R² of the non-linear regressions should be higher than those of the linear ones. Table 1 summarizes the Spearman correlations of all features with job satisfaction, without transformation, and with the transformation in the case of the AD features. It is evident from the results that the assumed curves of the job features provide a better description of their true nature than a linear relationship. In every case, except for 11a, non-linear regression results in a higher R² than using linear regression.

The transformed dummy variables for the additional decrement Vitamins provide much higher and more significant Spearman correlations than their non-transformed counterparts (first column). If the additional decrement features are split into two variables each, one for the left and one for the right side of Figure 1, they show the expected direction. Increasing a specific feature to a moderate level is related to higher job satisfaction, but after a subjective optimum, the reported correlations become negative. This indicates that at high values the Vitamin becomes toxic and is then related to a decrease in job satisfaction.

Spearman's rho and linear and non-linear regressions were used to analyse the data, where subjective job satisfaction was the dependent variable. As Table 1 reported, not every additional decrement feature had a significant relationship with job satisfaction. This could indicate that even though a Kunin-scale was used, not every participant fully understood the nature of the items.

Nevertheless, these results support the assertion of the Vitamin model that non-linear relationships exist between job characteristics and employee well-being. Furthermore, the results offer a detailed impression regarding the relationship between job features and employee subjective well-being, which can be an advantageous indicator for social sustainability (Meyerding, 2014a).

CONCLUSIONS

The major aim of this study was to identify the relationship of job characteristics and job satisfaction in German horticulture. Traditionally, linear relationships are assumed in psychological research. However, Warr (1987) challenged this belief by presenting the non-linear Vitamin model.

In this study, 28 job aspects, which describe the 12 Vitamins of Warr's model, were analysed and their relationship with employee subjective well-being were investigated. A comparison between the results of linear and non-linear regressions, as well as between the correlation coefficients for different sections of the curves of additional decrement features,

were done to examine the true nature between the relationship of the job aspects and job satisfaction. In all cases, the assumed non-linear shapes were superior to the linear model. A linear regression, with transformed additional decrement features for the whole model used in this study, reported a remarkable R^2 of .627. These findings extend those of De Jonge and Schaufeli (1998) to all Vitamins of Warr's model (Warr, 2007) (with some adjustments).

In addition, most job aspects were significantly correlated with job satisfaction. The highest significant correlation with job satisfaction was good future prospects, $r_s = 0.64$, p (two-tailed) <0.01 , which indicates the importance of considering the employees personal goals and communicating a positive picture of the future. There was a significant relationship between the organization's morality in society and job satisfaction ($r_s = 0.53$, p (two-tailed) <0.01). This result presents a link between job satisfaction and sustainability. It might be the case that the more sustainable the employees believe the company they are working in is, the higher their job satisfaction.

The significance of the job to self was significantly related to job satisfaction ($r_s = 0.48$, p (two-tailed) <0.01). This indicates the importance of communicating the significance of every job to employees. It might be helpful to give them an understanding of how their work fits into the whole production process and the effects of their work on the next in line, and who is directly reliant on their work.

In this study in German horticulture, a lack of work-family conflict was strongly related to job satisfaction ($r_s = 0.48$, p (two-tailed) <0.01). Improving this job feature in German horticultural companies could therefore lead to higher employee well-being and could also be of importance in attracting new qualified employees. Another interesting result is the highly significant and relatively strong correlation of adequate equipment and job satisfaction ($r_s = 0.45$, p (two-tailed) <0.01). This feature is especially important in jobs where primarily physical work has to be done.

This is, to the author's knowledge, the first quantitative study to investigate the relationship of job characteristics and job satisfaction in German horticulture. Additionally, it is the first study to the author's knowledge to test all Vitamins of the latest version of Warr's Vitamin model. The results provide compelling evidence of the superiority of non-linear models in the field of psychological research when it comes to understanding employee subjective well-being. The results of this study provide a deeper understanding and new insights into employee well-being in German horticulture. They also support the approach of using employee subjective well-being as a key indicator for social sustainability in horticultural companies (Meyerding, 2014a).

Some limitations however, are worth noting. Although 23 out of 28 job aspects were found to be related to job satisfaction in German horticulture, a larger sample of participants would be desirable. Additionally, it is clear that job satisfaction depends on both jobs and job-holders (Warr, 2013), therefore future research will analyse the impact of personal characteristics on job satisfaction in German horticulture. It is also evident, that the importance of job features differ between individuals. Future work will, therefore compare the relationship with subjective well-being and the preferences of different groups. Research opportunities also lie in the identification of differences between objective measurements of job characteristics and the subjective evaluations reported in this study.

ACKNOWLEDGEMENTS

Thanks to Dr. Bernd Hardeweg for statistical assistance and Katherine Bruns for professional advice.

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