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Exploring Work from Home: Scale Construction and Its Use in Determining Croatian Engineers' Job Satisfaction

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Abstract

Working from home and work flexibility have been highly researched academic topics over the past forty years, and their importance was further amplified during the COVID-19 pandemic. Numerous qualitative and quantitative studies were aimed at better understanding this work arrangement, but they often encountered the challenges of limited scope and the inability to generalize their results. The goal of this study was to test the consistency of the instrument used in measuring the experiences of working from home for Croatian engineers, check the presence of its latent dimensions, and finally determine whether these dimensions could predict engineers' job satisfaction. Three factors were extracted by exploratory factor analysis (productivity and work quality, work-life balance, and organizations' distrust and control), while the multiple linear regression analysis ran on those factors as predictors proved that, although work-life balance does not influence job satisfaction, productivity and work quality positively predict it, while organizations' distrust and control do so negatively.

Keywords: work from home, exploratory factor analysis, multiple linear analysis, job satisfaction, Croatian engineers

1. Introduction

Over the past forty years, working from home has emerged primarily as a significant topic in academic research on work flexibility. However, the main driving force behind the growth in interest in working from home was certainly based on the rapid development of information technologies, and especially the Internet. As early as the early 1980s, futurologically oriented academics put forward the idea of an "electronic cottage" that symbolized the spatio-temporal autonomy of experts whose remote work was based on the use of computers [1]. The idea, as it seemed, fit into the broader process of restructuring the existing division of labor in developed industrial countries and the need to find new and more flexible patterns to resolve the stalemate in the process of capitalist accumulation and reproduction caused by the decline of the Fordist model of division of labor dominant at that time [2], [3].

In a series of studies and theoretical explanations since the mid-1980s, work from home has found its place in the field of spatial flexibility of work [4]. To date, it has been considered in a matrix that included: changes brought on by the growing technological possibilities for its realization [5]; challenges of effective work organization, i.e. issues of autonomy and control [6]; skills and qualifications necessary for its implementation, that is, an analysis of occupations and professions for which it would be appropriate [7]; challenges in reorganizing previously divided aspects of paid work and private life [8]; changes in employment types and career issues [4]; possibilities of its incorporation into legislation [9]; and, finally, its actualization – the actual share in the contingent of the labor force affected by it [10].

The initial optimism of futurists and technology enthusiasts has been continuously questioned by research findings that have shown how, despite decades of rapid growth in technological capabilities, working from home has different outcomes not only within individual professional categories, but also among them [11]. Also, the work-life dichotomy has proven to be an important issue, especially when accompanied by the growing needs of work efficiency and its organization [8]. Finally, perhaps the most important question about the possibilities of organizing work from home, up until the COVID-19 pandemic in 2020, stemmed from the fact that the share of employees working from home, even in the most developed economies, rarely exceeded 20% [12]. In other words, despite its great potential in terms of flexible work organization, this phenomenon has remained largely neglected in practice.

One of the issues, which is of central importance for this article, was related to the approaches in researching work from home. On the one hand, numerous qualitative research provided a better understanding of work from home and enabled the development of theoretical constructs [13], [14], [15], [16]. For example, one of the most widely used theoretical approaches when examining work from home, border theory, was a product of qualitative research [13]. Nevertheless, numerous and relevant qualitative studies have continuously faced objections towards their relatively limited scope in terms of generalization. On the other hand, quantitative research, despite copious amounts of available data, often encountered challenges in harmonizing instruments and metrics as well as the problems of representativeness of the samples they used [17].

With regards to the latter, the mentioned issues form the crucial basis for this article. Starting from the assumption that generating appropriate scales for measuring work from home among specific segments of the workforce would contribute to the discussion on open issues of research standardization [18], the basic idea of the paper was to reconsider the compatibility of the instrument it used in studying work from home among Croatian engineers with theoretical concepts that were used in its development. In doing so, the focus on Croatian engineers was seen as justified in many ways. Engineers, as a professional category, are a part of the segment of the workforce that fits into most of the dimensions in the aforementioned matrix for the study of work from home. They are key actors in the growth of technology and related knowledge and skills, and are, by the very nature of their jobs, preoccupied with issues of work organization efficiency. They are also subject to unpredictable changes in the labor market, resulting from the growing flexibility of work, which are reflected in their predominantly precarious careers [19]. Since the instrument for researching various aspects of work from home among Croatian engineers was developed by independently creating individual items, while also relying on some already existing research recommendations [20], the suitability test of the developed scale, as well as testing the existence of its latent dimensions, was carried out by exploratory factor analysis. This lead to a meaningful reduction of the instrument which, in its final version, may be useful in future research on work from home. In addition, multiple linear regression has been conducted to determine whether, and to what degree, can the retained latent dimensions explain job satisfaction among engineers, since most of the research to date has shown that the experience of working from home, or at least some of its aspects, influences job performance, training opportunities, relationships with colleagues, and consequently overall job satisfaction.

2. Theoretical background

Working from home is, like all dimensions of the post-industrial division of labor, affected by the knowledge economy [21], flexible firm [22] and new forms of work and employment [4]. In public discourse, this arrangement is promoted mainly as a win-win situation in which employers benefit from various types of savings related to the workspace while maintaining labor productivity and which presents employees with greater opportunities to reconcile their private and work life with increased job satisfaction and commitment [11]. At the same time, the issue of trust, perceived by employers in terms of labor productivity and by employees in terms of job security, was mainly viewed as self-evident. However, research on the experience of working from home has shown that the perception of it being a win-win arrangement is based on a naïve understanding of the nature of modern work and that the incidence of working from home varies greatly depending on a number of mediating factors such as employment type, suitability of tasks, organizational culture, position in organizational hierarchies, interaction patterns at work, technological skills, family environment, etc.

In designing the instrument for researching work from home among Croatian engineers, the mentioned mediating factors were observed through theoretical approaches and research findings that focus on the quality of working from home, the possibilities of work-life balance, and the issue of organization and control of work from home. All three aspects are intertwined in the daily experience of remote work and will be presented in broad strokes below, in order to clarify the basic categories used for the development of the research instrument.

From a predominantly managerial and employer perspective, the *quality of work* from home is often reduced to the issue of *productivity* [16], [17]. According to Donnelly and Proctor-Thompson [16], such an approach is predictable and is based largely on cost-benefit analyses that indicate how positive outcomes are embedded in the expectations of both employers and employees. On the one hand, higher productivity has indeed been confirmed in some studies [23], [24], but the issue of productivity measurement is questioned, given that the findings are mostly based on self-statements [17]. Bailey and Kurland [17, p. 389] warn that these results should not be taken at face value, since employees who decide to work from home on their own, as well as those who are forced to do so, find themselves in a position to defend that kind of work and present it as successful and productive. In addition, Bailey and Kurland refer to research findings showing that employees working from home often equate the issue of productivity with the amount of work-hours, reporting they work too much. This coincides with the findings of a Eurofound and ILO [9] survey about how long working hours (more than 48 per week) are a significant feature of work arrangements of different types of teleworkers, including those working from home. Although the abundance of self-reports of increased productivity from home cannot be ignored, in order to fully understand the quality of work, additional dimensions should be included.

One of them is the issue of autonomy in terms of work organization and ways of solving work tasks. Research shows that spatial flexibility allows employees to intervene autonomously in regular work schedules, which often results in "porous" patterns of working hours that deviate from the usual eight-hour workday in an office [25]. A similar situation involves task discretion as an informal understanding between employees and their managers, often covered in research based on social exchange theory which states that employees would be willing to work harder or longer hours in exchange for the option of altering their work arrangements, both spatially and temporally [11], [15].

The second dimension of work quality relates to the connection with other employees and includes not only the issue of isolation and technical aspects of communication, but also opportunities for non-formal learning and mentoring, and is usually reflected in general job satisfaction. Summarizing the results of previous research, Brunnelle and Fortin [26] view the issue of isolation and the absence of frequent face-to-face interactions with co-workers as the biggest challenge teleworkers are facing. This means that working from home involves making a conscious effort to create additional opportunities to establish formal and informal interactions. In practice, however, such efforts are addressed mainly by holding online meetings which is a weak substitute for negative consequences affecting workers' performance, satisfaction and working relationships [27], [28]. This is confirmed in the research by Bailey et al. [29] on the challenges of workplace socialization for remote workers which shows how teleworking not only often remains outside the scope of traditional socialization goals, but also opens new or different patterns of organizational identification and career issues.

The general assumptions of border theorists on how work from home reflects on the *work-life balance* coincide with the mixed results of research conducted to date [9], [11], [12], [13], [30]. This is not surprising since the workplace in industrialized countries throughout the 20th century was a distinctive location outside one's own home. With technological growth and efforts towards spatial flexibility, this constellation has changed primarily among middle-class professionals. However, the relocation of paid work to the nominally private sphere has led to a change in the social meaning of space and time. This manifested in the need to redefine private space, which has a strong emotional dimension for people, as well as in the need to redefine the length of working hours – i.e. in a more or less clear distinction between paid and unpaid work and non-work. Clark [13] summarized these challenges in terms of border theory, pointing out that the basic features of borders are contained in their permeability and flexibility. In that sense, permeability refers to psychological and behavioral aspects of the process of intertwining work with family life, while flexibility indicates the extent to which one domain can shrink or expand to meet the requirements of another domain [8]. However, as Karassvidou and Glaveli [30] note, this theory somewhat failed to explain the factors (spatial, temporal, personal, organizational, gender, cultural, etc.) that contribute to the permeability and flexibility of borders, which manifested itself in inconsistent methodologies and research results around the world [12].

Finally, the third theoretical aspect of working from home used for developing the instrument for this study relates to the issues of *management and control* in this kind of work, as a permanent and dominant preoccupation of managerial structures in organizations that has, according to some authors [31], [32], become a central element of modern organizations. In a review of studies on organizational control, de Vaujany et al. [33, p. 678] point out that this is a basic principle in achieving organizational goals – control is the formal or informal ability of managers to act with the aim "to direct or influence their employees' conduct, in a 'balanced' manner entailing both motivating incentives and effective sanctions, so that they result in behavior consistent with organizational aspirations, rules and objectives". Over the past century, organizational control has taken its dominant pattern in the form of Taylorist scientific management, which insists on a strict division of labor between managers and their subordinates as a key prerequisite for establishing a functional organizational structure. Contrary to the initial belief that this management style would lead to higher levels of productivity, it primarily resulted in underqualification of work, its monotony, and distrust of managers towards workers. This distrust is well captured by McGregor's theory of X management [34] which is based on the assumption that workers avoid work at every opportunity and should therefore be forced to work under strict supervision and threats of punishment in order to make the efforts necessary to achieve organizational goals.

As one of the factors in the decline of the Fordist model of division of labor [35], the Taylorist pattern of control survived to this day and even imposed itself as an integral part in the development of new, flexible forms of work which were believed to open a new space for the expansion of work autonomy and job discretion in post-industrial knowledge economies. This survival of Tayloristic organizational principles in employee motivation [4] in a form of digital Taylorism represents a new and technologically supported form of employee control, which, along with an organization's or employer's trust, becomes one of the most important challenges in organizing work, especially the remote kind.

As an unforeseen consequence of new forms of work, organizational control of work from home was confirmed in a series of studies that showed that: managers do not support this type of working arrangement and reluctantly allow it; the temporal flexibility of this kind of work is absent, since it tends to follow the traditional work schedule; employees working from home must continuously prove the effectiveness of their work, often by showing constant presence and availability, etc. [6], [17], [29], [33], [36], [37], [38]. Employees experience growing career uncertainty, and their anxiousness is only deepened by the belief that physical presence at work ("face-time") is "necessary to signal work devotion to colleagues and managers" [38, p. 4]. With all the suspicion expressed by managers and employers, it seems as though flexible work policies are at an impasse.

As already mentioned, the three presented aspects of the organization of work from home formed the basis for developing the instrument used in researching work from home among Croatian engineers.

3. Methodology

3.1. Research goals and methods

Apart from the fact that the developed questionnaire has never been used, it is also, as it will later be demonstrated, quite comprehensive, so the main intent of this preliminary survey was to test its consistency and see if the presence of the predicted domains of homeworking can be confirmed. Apart from that, another goal of this paper was to follow this up with shortening and simplifying the questionnaire to ensure its potential for broader use. Finally, the last goal of this study was to determine whether attitudes and experiences of working from home influence job satisfaction in respondents.

The research questions in this study can hence be summarized into two:

1. What are the latent dimensions present in the questionnaire used to measure Croatian engineers' experiences and attitudes towards homeworking?
2. Are there any significant correlations and causations between the obtained dimensions and job satisfaction?

To give an answer to the first research question, and to achieve the first two research goals, this study used an exploratory factor analysis (EFA), while the multiple linear regression analysis was applied in order to answer the second question and to accomplish the third goal.

3.2. Questionnaire

The questionnaire was divided into four parts, totaling 63 questions. Two of its parts, not examined in this paper, dealt with the respondents' sociodemographic characteristics, their place of work and its suitability for homeworking, and finally the circumstances and conditions of their working from home experience. The remaining two parts consisted of 34 items measuring engineers' attitudes and experiences of home working and their job satisfaction on a 5-point scale, ranging from "1 – Don't agree at all" to "5 – Completely agree".

As it was already mentioned, the specific variables intended to measure homeworking attitudes and experiences were compiled and included in the questionnaire according to three predicted domains: management and control (MC) of workspace and working hours, work-life balance (WLB), and productivity and work quality (PWQ). The total number of variables in this part of the questionnaire was 29 and their initial content and arrangement can be seen in Table 1.

Domain		Item	$\bar{x}$	SD
Management and control	MC1	The prevailing view in the organization is that employees are more productive when working in the office than from home	3.26	1.248
	MC2	I feel that I constantly have to prove that I'm actually working	2.51	1.344
	MC3	My superiors tend to put more emphasis on controlling our work than its effectiveness/quality	2.35	1.410
	MC4	There's a prevailing distrust in my organization about the quality of work from home	2.63	1.46
	MC5	I tend not to use sick days or paid leave because I think my superiors wouldn't believe me	1.88	1.180
	MC6	I have a hard time justifying overtime	2.18	1.377
	MC7	I'm worried that I'll get fired in the event of company restructuring or lower profits	1.78	1.104
	MC8	I'm less likely to be promoted compared to my colleagues	2.24	1.304
	MC9	I feel that my colleagues will forget about me while planning major projects	2.38	1.149
Work-life balance	WLB1	I often feel overwhelmed with work responsibilities	3.04	1.108
	WLB2	I often find myself working overtime or on weekends	2.71	1.342
	WLB3	I don't have enough time for my family, friends and hobbies because of work	2.80	1.380
	WLB4	In my organization, employees are expected to be available in their free time	2.51	1.390
	WLB5	Work responsibilities negatively affect my private life	2.53	1.320
	WLB6	I feel my home has turned into an office	2.84	1.385
Productivity and work quality	PWQ1	In general, the quality of my work from home is better than that in the office	2.97	1.186
	PWQ2	When I work from home, I tend to finish tasks faster	3.06	1.255
	PWQ3	Working from home allows me to better organize my time and work tasks	3.48	1.250
	PWQ4	At home I have less distractions and it's easier for me to concentrate on more complex tasks than in the office	2.92	1.387
	PWQ5	I can provide information, ideas and instructions to others via online platforms with ease	3.21	1.267
	PWQ6	If I worked from the office, I would be able to get help from colleagues easier and faster	3.93	1.041
	PWQ7	Since working from home, it is harder for me to do tasks that require teamwork	3.39	1.145
	PWQ8	When I work from home, my working hours are longer than usual	3.22	1.275
	PWQ9	I always know what is expected of me and what my responsibilities are	4.00	0.896
	PWQ10	The quality of online meetings is worse than the meetings in real life	3.27	1.324

	PWQ11	Work from home requires more meetings and coordination than work in the office	3.37	1.085
	PWQ12	Online meetings are mostly a waste of time	2.76	1.142
	PWQ13	Teamwork quality declines when some members work from home	3.04	1.202
	PWQ14	Working from home has negatively affected my professional development and new skills acquisition	2.56	1.289

Table 1. Initial questionnaire measuring Croatian engineers' homeworking experiences with means and standard deviations (N=158)

A significantly shorter instrument was used to measure the engineers' job satisfaction (JS) in this study, consisting of only five variables presented in Table 2 below.

Domain		Item	$\bar{x}$	SD
Job satisfaction	JS1	Generally speaking, I'm happy with my job	3.93	0.860
	JS2	I often think about quitting	2.30	1.181
	JS3	I regularly search for new job ads	2.25	1.231
	JS4	I wouldn't mind spending the rest of my career in the organization where I currently work	3.20	1.122
	JS5	I get along well with my colleagues	4.35	0.715

Table 2. Initial questionnaire measuring Croatian engineers' job satisfaction with means and standard deviations (N=158)

3.3. Sample and data collection

The preliminary survey was conducted on a non-probabilistic convenience sample of mechanical, civil, and electrical engineers in Croatia between July 1st 2021 and October 30th 2021 using an online questionnaire via LimeSurvey service. The research used snowball sampling in a way that the online survey link was first sent to the alumni associations of Croatia's biggest engineering faculties[1] that were asked to disseminate the link to their graduates, who were then asked to forward it to any colleagues they thought would be interested in participating. A total of 158 respondents was surveyed, predominantly located in Croatia's two largest cities, with slightly more than 60% of them being from Zagreb and 20% from Split.

4. Results

4.1. Factor analysis

As already mentioned, in order to identify the underlying factors and provide a structural representation of homeworking experiences, an exploratory factor analysis (also known as common factor analysis) was conducted on the measured variables

[1] Faculty of Mechanical Engineering and Naval Architecture and Faculty of Electrical Engineering and Computing of the University of Zagreb, Faculty of Electrical Engineering, Mechanical Engineering and Naval Architecture of the University of Split, and to Zagreb University of Applied Sciences.

previously shown in Table 1. As the goal of this paper was to explore latent constructs that explain homeworking experiences, EFA will be used instead of the, perhaps more common, principal component analysis (PCA), as most methodologists recommend [39, p. 228]. The EFA of this paper was conducted via JASP, an open-source statistics program, using the *principal axis* factoring method to extract a common factor model, as, according to Watkins [39, p. 229], it outperforms the other most common method of *maximum likelihood*, especially when variables and factors are weakly correlated (which is true for most of the factors in the initial solution, as will be demonstrated) and sample sizes are smaller than 300, which also fits the analyzed data. Finally, as it is frequently the case in social sciences, the theorized factors are expected to be correlated so oblique rotations (oblimin) was applied.

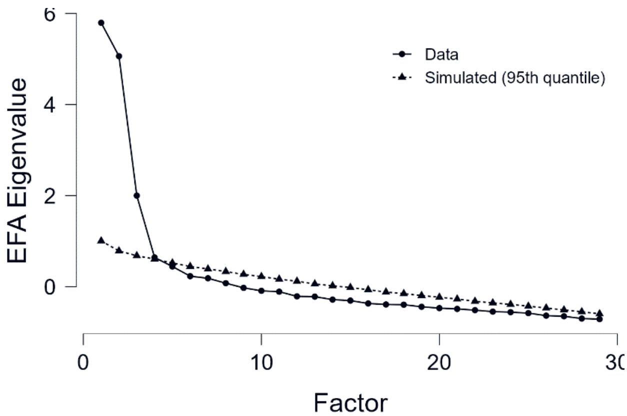

Figure 1. Scree plot of EFA eigenvalues

In order to estimate how many factors should be retained, parallel analysis was applied to the EFA. According to the scree plot (Figure 1), it can be seen that the eigenvalues reach their inflection point at the fourth retained component, while only three factors are above the line of the parallel analysis' simulated data, which indicates that those three factors should be retained. Since the theory underlying the questionnaire design also expected three latent constructs, namely *management and control*, *work-life balance*, and *productivity and work quality*, after testing the appropriateness of the correlation matrix for factor analysis with Bartlett's test of sphericity and Kaiser-Meyer-Olkin's test (KMO), three factors will be examined in order to attain *simple structure* as defined by Thurstone [39]. Factor loadings for the initial solution of the structure matrix are presented in Table 3.

	Factor 1	Factor 2	Factor 3
MC1	0.000	**0.522**	0.116
MC2	-0.085	**0.740**	0.227
MC3	-0.202	**0.837**	0.227
MC4	-0.209	**0.895**	0.268
MC5	0.034	**0.671**	**0.447**
MC6	0.078	**0.594**	**0.518**

	Factor 1	Factor 2	Factor 3
MC7	0.027	**0.468**	**0.369**
MC8	0.042	**0.597**	0.254
MC9	0.091	**0.565**	0.283
WLB1	-0.181	**0.373**	**0.780**
WLB2	-0.079	0.185	**0.792**
WLB3	-0.144	0.209	**0.844**
WLB4	0.002	**0.354**	**0.640**
WLB5	-0.065	**0.365**	**0.761**
WLB6	0.145	0.179	**0.543**
PWQ1	**-0.810**	0.192	0.185
PWQ2	**-0.787**	0.262	0.235
PWQ3	**-0.729**	0.170	0.104
PWQ4	**-0.739**	0.237	0.215
PWQ5	**-0.640**	0.037	0.004
PWQ6	**0.577**	-0.111	-0.061
PWQ7	**0.702**	-0.045	0.028
PWQ8	0.235	-0.020	**0.359**
PWQ10	**0.634**	0.013	0.117
PWQ11	**0.492**	-0.015	0.103
PWQ13	**0.716**	0.058	-0.016
PWQ14	**0.624**	0.178	0.061
PWQ9	-0.286	**-0.353**	-0.132
PWQ12	**0.340**	0.180	0.108

Table 3. Initial EFA solution (Structure Matrix)

The results of Bartlett's test showed that the correlation matrix was not random ($p<.001$), while the KMO statistic was satisfactory (.83), or as Kaiser [40] put it, meritorious, which means EFA can be applied.

The initial solution, where three factors were manually retained, accounted for 47.30% of the total variance, with the first factor accounting for 20.90%, the second one for 18.60%, and the third for 7.80%. The inter-factor correlations were relatively low, as shown in Table 4.

	Factor 1	Factor 2	Factor 3
Factor 1	1.000	-0.102	-0.069
Factor 2	-0.102	1.000	0.340
Factor 3	-0.069	0.340	1.000

Table 4. Inter-factor correlations of the initial EFA solution

Retained factors of a methodologically and theoretically acceptable "simple structure", according to Watkins [39, p. 235], must meet several criteria: (1) each factor should be saliently loaded by at least three variables, (2) each variable should load saliently on only one factor, (3) each factor should demonstrate internal consistency reliability ≥.70, and (4) all factors should be theoretically meaningful [39, p. 234-235].

Having these prerequisites in mind, in the first iteration of EFA, the items MC5, MC6, MC7, WLB1, WLB4 and WLB5 were removed due to their double loading, i.e. due to the presence of loadings above .300 on more than one factor. After their removal, item PWQ2 showed double loadings, so that was the only variable removed in the second step of analysis. After its removal, item PWQ9 demonstrated double loadings, so this variable was removed in the third iteration of EFA. No more items showed double loadings after this iteration.

Apart from not having any double loadings, as can be seen in Table 5, this iteration also meets three other simple solution criteria: all three factors are loaded with at least three variables (specifically, the first factor with 11, the second with six, and the third with four items); each factor has an internal consistency reliability greater than ≥.70 (Factor 1=.873, Factor 2=.852, and Factor 3=.734); and all factors are generally theoretically meaningful. Although item PWQ8 theoretically belongs to the Productivity and work quality domain, considering its content being related to longer working hours, its grouping with the variables in the Work-life balance domain is neither surprising nor theoretically inexplicable.

	Factor 1	**Factor 2**	**Factor 3**
MC1	0.023	**0.558**	0.071
MC2	-0.050	**0.747**	0.173
MC3	-0.177	**0.854**	0.169
MC4	-0.174	**0.927**	0.189
MC8	0.063	**0.553**	0.172
MC9	0.106	**0.534**	0.219
WLB2	-0.067	0.156	**0.761**
WLB3	-0.119	0.191	**0.828**
WLB6	0.165	0.128	**0.539**
PWQ1	**-0.773**	0.234	0.208
PWQ3	**-0.684**	0.231	0.113
PWQ4	**-0.698**	0.282	0.178
PWQ5	**-0.630**	0.094	0.015
PWQ6	**0.582**	-0.100	-0.014
PWQ7	**0.726**	-0.085	0.035
PWQ8	0.250	-0.030	**0.397**
PWQ10	**0.658**	-0.017	0.123
PWQ11	**0.521**	-0.039	0.109
PWQ13	**0.742**	0.037	-0.048
PWQ14	**0.648**	0.118	0.029
PWQ12	**0.369**	0.176	0.059

Table 5. “Simple” EFA solution (Structure Matrix)

As shown in Table 6, this iteration’s inter-factor correlations are still relatively low, and even lower than those of the initial solution.

	Factor 1	Factor 2	Factor 3
Factor 1	1.000	-0.120	-0.046
Factor 2	-0.120	1.000	0.217
Factor 3	-0.046	0.217	1.000

Table 6. Inter-factor correlations of the “simple” EFA solution

Although a simple solution has been achieved, as can be seen in Table 7, the same cannot be said for its goodness of fit, with the Tucker-Lewis Index (TLI) lower than .90 and the Root Mean Square Error of Approximation (RMSEA) higher than .08. Apart from that, some of the variables kept in this solution, specifically PWQ8 and PWQ12, have weak loadings (below .04), so in order to achieve better fitness of the instrument, those variables were removed in the next EFA solution.

RMSEA	RMSEA 90% confidence	TLI	BIC
0.093	0.081 - 0.106	0.790	-404.166

Table 7. Fit indices of final EFA solution

Finally, in the last few EFA iterations, a total of six items from the original questionnaire were removed, so the entire instrument could be theoretically and conceptually sounder. This was done by going through the content of the kept variables in each factor separately, starting with the second factor, since this factor gathered the variables of the first theorized domain, Management and control. After the fifth EFA solution, this factor is loaded with six variables, now mainly related to the control and supervision aspect of homeworking, with the exception of items MC8 and MC9 that are more related to the employees’ fear of being left out. Apart from that, these variables also saturate Factor 2 the least, with loadings of .551 and .536 respectively, which is the reason why they were removed in the sixth EFA solution.

Since the third factor, which gathered variables from the Work-balance domain, consists of only three variables after the fifth EFA solution (the minimum for maintaining a simple solution), its content wasn’t further modified.

However, with the removal of items MC8 and MC9, one item (PWQ4) from the first factor, the one gathering the variables from the Productivity and work quality domain, shows double loading, also saturating the second factor. Besides, since it is fairly similar to item PWQ3, but with a somewhat greater standard deviation, it is the first item removed from this domain in the seventh iteration of EFA. Alongside item PWQ4, items PWQ5, PWQ7 and PWQ11 were also removed in this iteration, the first one because of its similarity to item PWQ6 which had an opposite orientation, simpler wording and smaller standard deviation, and the latter two because item PWQ13 represents a general and comprehensive representation of them both, all in order to achieve a more parsimonious instrument.

This final solution, as shown in the Table 8, consists of 13 variables in total, spread across three factors. The first one, with a Cronbach α value of .827, gathered six variables from the theorized domain *Productivity and work quality* (PWQ) that can, considering it kept all of its initial variable diversity, also keep the same name.

The same can be said for the third factor (α=.734) that loaded three variables of the theorized domain named *Work-life balance* (WLB). The only factor whose content changed significantly is the second one (α=.896) consisting of four variables from the original domain Management and control, which can now, considering the content of the variables that remain, be renamed *Organizations' distrust and control* (ODC) towards homeworking.

	Factor 1	Factor 2	Factor 3
ODC1	0.064	**0.579**	0.068
ODC2	-0.045	**0.789**	0.170
ODC3	-0.156	**0.893**	0.195
ODC4	-0.141	**0.901**	0.201
WLB2	-0.071	0.189	**0.780**
WLB3	-0.135	0.169	**0.892**
WLB6	0.126	0.080	**0.454**
PWQ1	**-0.810**	0.246	0.208
PWQ3	**-0.668**	0.235	0.120
PWQ6	**0.544**	-0.102	-0.037
PWQ13	**0.772**	0.020	-0.093
PWQ14	**0.617**	0.074	0.012
PWQ10	**0.622**	-0.010	0.079

Table 8. Final EFA solution – Factor Loadings (Structure Matrix)

The final EFA solution accounts for 54.80% of the total variance, with the first factor accounting for 24.20%, the second one for 19.20%, and the third for 11.40%. According to Bartlett's test, the matrix is still not random (p<.001), the KMO statistic is also still satisfactory (.75), while the inter-factor correlations are now, although slightly higher than those of a "simple solution", lower than those in the initial solution, as can be seen in Table 9.

	Factor 1	Factor 2	Factor 3
Factor 1 (PWQ)	1.000	-0.119	-0.110
Factor 2 (ODC)	-0.119	1.000	0.212
Factor 3 (WLB)	-0.110	0.212	1.000

Table 9. Inter-factor correlations of the final EFA solution

Finally, as shown in Table 10, this solution has a TLI of .955 and an RMSEA of .053, which attests to the good fit of this model.

RMSEA	RMSEA 90% confidence	TLI	BIC
0.053	0.018 - 0.082	0.955	-151.417

Table 10. Fit indices of final EFA solution

4.2. Multiple linear regression analysis

Although the variables intended to measure job satisfaction showed reasonable internal consistency (α=.794) and correlation coefficients, in order to provide an answer to the second research question in the simplest manner, linear regression was conducted only on the first, most general, satisfaction variable. Given that the correlation matrix shows moderate to large correlations of the rest of the variables with the first one, with their Pearson's r ranging from .386 to .606, using it as a proxy for overall job satisfaction seems justifiable.

Since the regression model has one dependent and multiple independent variables, namely three factors obtained from the previous exploratory factor analysis, the multiple linear regression model was used to explore the existence of significant correlations and causations between them. In order to do so, and not risk the collinearity problem that would've been present if using the variables that make up the factors, the regression will be analyzed by using the factor scores saved after the final EFA iteration.

Before examining the linear regression results, it is necessary to check if the use of multiple linear regression (MLR) is even justified, specifically if the assumptions of the independence of observations, linearity, homoscedasticity, additivity, and normality are satisfied.

As can be seen in Table 11, the Durbin-Watson statistic for this regression model is 1.765 and, since its value is close to 2, it can be concluded that there is no correlation between residuals, i.e. that the residuals are independent and that the first assumption is satisfied.

					Durbin-Watson		
Model	**R**	**R^2**	**Adjusted R^2**	**RMSE**	**Autocorrelation**	**Statistic**	**p**
H_1	0.472	0.223	0.208	0.766	0.106	1.765	0.130

Table 11. Initial MLR model summary

As Figure 2 shows, the linearity assumption is also satisfied, meaning that there is a linear relationship of independent variables with the dependent one, both collectively and individually, together with the one related to homoscedasticity, according to which the spread of the variance is equal both for the residuals and the predicted values.

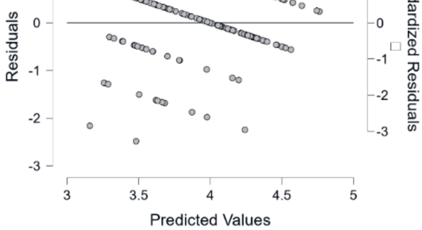

Figure 2. Residuals vs. predicted values

As the correlation matrix of the independent variables (Table 12) indicates, there are no high correlations between the kept factors, which means that there is no multicollinearity problem in this model and that the additivity assumption is satisfied as well. The Tolerance (ranging from .949 to .994) and Variance Inflation Factor (VIF) values (ranging from 1.006 to 1.048) of this model confirm that.

Variable	Factor 1	Factor 2	Factor 3
1. Factor 1 (PWQ)	—		
2. Factor 2 (ODC)	0.075	—	
3. Factor 3 (WLB)	0.003	0.214	—

Table 12. Correlation matrix of the factors (independent variables in MRL)

Finally, as Figure 3 shows, the standardized residuals of this model are somewhat normally distributed, meaning that the last assumption justifying the conduct of the MLR is also satisfied.

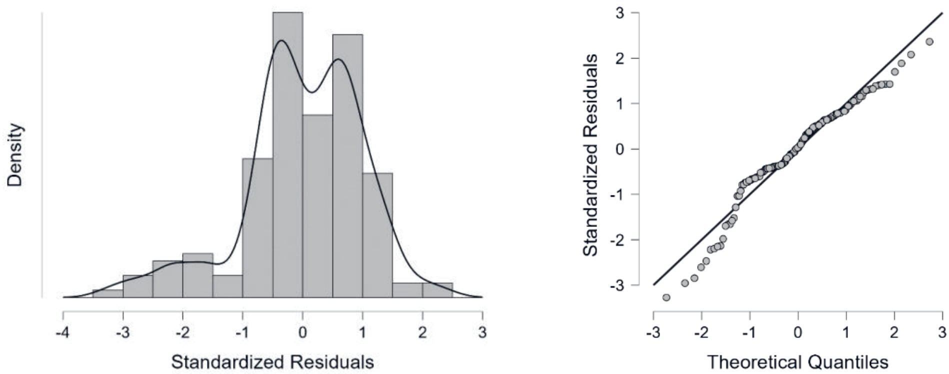

Figure 3. Standardized Residual Histogram and Q-Q Plot Standardized Residuals

Looking back at the model summary, shown in Table 10, the multiple correlation coefficient (*R*) is .472, which indicates moderate to strong linear association between this model's independent variables (factors) and the dependent one (job satisfaction), while the squared multiple correlation coefficient (R^2) equals to .223, meaning that the three factors together explain a significant 22.30% portion of the variability of the job satisfaction variable. Even when considering the value of adjusted R^2 (.208), the experience of homeworking still explains slightly more than 20% of the variance in the engineers' satisfaction with their jobs.

Model		Sum of Squares	df	Mean Square	F	p
H_1	Regression	25.909	3	8.636	14.724	< .001
	Residual	90.325	154	0.587		
	Total	116.234	157			

Table 13. ANOVA of the initial MLR model

Since the *p* value of this regression model is less than .05, as can be seen in Table 13, it can be concluded that it is statistically significant. However, by observing the *p* values for each independent variable in the Coefficients table of this MLR model (Table 14), it becomes clear that Factor 3 (WLB) isn't statistically significant (p=.693) and that there is no association between the changes in that independent variable and the shifts in the model's dependent variable. To put it more simply, work-life balance does not influence job satisfaction and, for the purpose of ensuring the model's precision, it will be removed from the MLR.

							Collinearity Statistics	
Model		**Unstandardized**	**Standard Error**	**Standardized**	**t**	**p**	**Tolerance**	**VIF**
H_1	(Intercept)	3.930	0.061		64.509	< .001		
	Fac1 (PWQ)	0.132	0.066	0.143	2.003	0.047	0.994	1.006
	Fac2 (ODC)	-0.409	0.066	-0.454	-6.220	< .001	0.949	1.054
	Fac3 (WLB)	-0.027	0.068	-0.029	-0.396	0.693	0.954	1.048

Table 14. Coefficients of the initial MLR model

As can be seen in Table 15 and Table 16, after removing the third factor from the MRL model, not much has changed – the model is still statistically significant, now with R and R^2 values being only slightly lower (.471 and .222 respectively), and the adjusted R^2 value being slightly higher (.212), meaning that in this model experience of homeworking altogether explains slightly more than 21% of the variance in the engineers' satisfaction with their jobs.

					Durbin-Watson		
Model	**R**	**R²**	**Adjusted R²**	**RMSE**	**Autocorrelation**	**Statistic**	**p**
H_1	0.471	0.222	0.212	0.764	0.112	1.753	0.115

Table 15. Final MLR model summary

Model		**Sum of Squares**	**df**	**Mean Square**	**F**	**p**
H_1	Regression	25.817	2	12.908	22.129	< .001
	Residual	90.417	155	0.583		
	Total	116.234	157			

Table 16. ANOVA of the final MLR model

The *p* values of both kept independent variables (Table 17) are statistically significant. However, from both their unstandardized and standardized coefficients it can be concluded that the second factor (ODC) is the better and much stronger predictor of job satisfaction. Those values also indicate that the independent variables negatively affect the dependent one, and while the increase in Factor 1 (PWQ) is associated with the increase of the independent variable, the increase in Factor 2 (ODC) results in its decrease. In more concrete terms, the organization distrust towards homeworking Croatian engineers experience predicts their job satisfaction to a greater extent than the productivity and quality of homeworking they report. Unsurprisingly, the greater the organizations' distrust and control, and the lower the engineers' productivity and quality of work done from home, the lower their job satisfaction.

Model		Unstandardized	Standard Error	Standardized	t	p	Collinearity Statistics	
							Tolerance	VIF
H_1	(Intercept)	3.930	0.061		64.685	< .001		
	Fac1 (PWQ)	0.132	0.066	0.143	2.014	0.046	0.994	1.006
	Fac2 (ODC)	-0.414	0.064	-0.460	-6.473	< .001	0.994	1.006

Table 17. Coefficients of the final MLR model

To build on an earlier conclusion, the two-factor MLR model of this study explains 21.20% of the total variance in the Croatian engineers' satisfaction with their jobs, and a great majority of that percentage is accounted for by the organization's distrust towards homeworking arrangements.

Finally, to exactly establish the effect sizes of the above-described coefficients, i.e. to see how much variance of the dependent variable does each independent variable account for while controlling the effect of the other, the part and partial correlations of the independent variables of the final MRL model were calculated and are shown in the Table 18.

Model		Partial	Part
H_1	Fac1 (PWQ)	0.160	0.143
	Fac2 (ODC)	-0.461	-0.459

Table 18. Part and partial correlations of the independent variables in final MRL model

From these partial coefficients it is again easy to infer that the second factor (ODC), with an R value of -.461, is more strongly connected to the dependent variable than the first one (PWQ), whose R value is much smaller and amounts to .160. However, the squares of these values are more interesting, since they indicate the variances of the dependent variable explained by solely one factor, without the influence of the other one and their overlap. That way, the first Factor 1 (R^2=.026) accounts for only 2.60% of the independent variable's variance, while Factor 2 (R^2=.213) accounts for 21.30% of it. This means that productivity and work quality which Croatian engineers report, while controlling the influence of their organizations' distrust towards homeworking, account for less than 3% of the job satisfaction variability, while, on the other hand, organization distrust and control, with the control of the productivity influence, account for more than 21%, the same as the overall model itself.

5. Discussion

The twofold goal of this paper was to first explore the latent constructs that explain the homeworking experiences of Croatian engineers in order to develop a more concise and simpler instrument, and later to check the influence of those constructs on the engineers' jobs satisfaction.

The predicted latent constructs were tested with an exploratory factor analysis, beginning with the parallel analysis which confirmed the existence of three theorized factors. Furthermore, the first goal of the EFA was to obtain the simple structure, which was achieved after the third factor iteration (Table 5) meeting all the simple solution criteria: all of the factors were theoretically meaningful, loaded with at least three variables (Factor 1 with 11, Factor 2 with 6, Factor 3 with 4 items), had no double loadings, and an internal consistency reliability greater than ≥.70 (Factor 1=.873, Factor 2=.852, and Factor 3=.734). Although *simple*, this solution had some problems, such as poor goodness of fit (TLI<.90 and RMSEA>.08) and weak loadings (<.04) of some variables, that required further iterations and item removal. Apart from achieving a statistically better fitting model, some of the items were removed in order to achieve a better theoretically and conceptually fitting instrument, i.e. the one that fits the predicted dimensions the most.

After a total of seven iterations, the initial instrument measuring the attitudes and experiences of working from home with 29 items was shortened to 13 items in total spread across three factors (Table 8). The domains kept explain almost 55% of the total variance, with the first one accounting for most and almost half of that amount (24.20%), and the second and third accounting for 19.20% and 11.40% respectively. Although renamed to better represent their items, the retained factors of *Productivity and work quality*, *Work-life balance* and *Organizations' distrust and control*, show a high level of consistency with the theorized domains, and correspond to their initial diversity, with the exception of the second factor (*Organizations' distrust and control*) whose content has been narrowed compared to the domain *Management and control* from which it originated.

To predict engineers' job satisfaction from the retained three factors, a multiple linear regression was analyzed and, although the model was statistically significant (Table 14) with a moderate to strong linear association (R=.472, p<.001) and more than 20% of variance explained, the *Work-life balance* factor (b=-.03, t=-.40, p=.693) did not prove to be a statistically significant predictor of job satisfaction. On the other hand, the remaining two factors were found to be both statistically significantly influencing job satisfaction, and while *Productivity and work quality* (b=.13, t=2.00, p=.047) predicted it positively, *Organizations' distrust and control* (b=-.41, t=-6.22, p<.001) did it negatively and to a greater extent. This means that engineer's job satisfaction increases with rising homeworking quality and productivity, and especially with the experience of less employer's control and distrust towards the effectiveness of that kind of work, while it decreases otherwise.

Although somewhat surprising, the finding that work-life balance isn't a good predictor of job satisfaction could be explained with the mentioned social redefinition of private and working life and space and their mutual permeation and spillovers. That could be the reason why employees don't perceive working overtime and its interference with their private obligations and leisure as problematic nor as something that could cause their overall dissatisfaction. On the other hand, the decreasing effectiveness and productivity, hindered teamwork and professional development, together with the constant pressure of proving otherwise, evidently affects employees more and leads to increased stress and dissatisfaction levels.

In order to reaffirm these results, especially that of the second factor being the better predictor of job satisfaction, partial correlations (Table 18) of the final MRL model factors (without the WLB one) were calculated. These correlations indicate that *Organizations' distrust and control* (R=-.461, R^2=.213) is indeed better at predicting job satisfaction than *Productivity and work quality* (R=.160, R^2=.026). More importantly, correlations indicate that the productivity and work quality of engineers alone (when controlling the influence of organizations' distrust and control) account for less than 3% of the job satisfaction variability, while organization distrust and control (when controlling the influence of productivity and work quality) account for more than 21%. In other words, the second factor (ODC) is a much better predictor of job satisfaction that on its own explains the same amount of its variance as the entire two- or three-factor model.

6. Study limitations

As mentioned earlier in the text, the sample size (N=158), its non-probabilistic convenience sampling and recruiting via snowball method pose some challenges in the generalization of results as they could be seen as leading to overrepresentation or underrepresentation of certain subsample groups, affecting both EFA and MLR.

Although it was not possible to infer which groups were under- or overrepresented, some subgroups stood out as obvious, most notably based on their geographic location (over 80% of respondents were from Croatia's two largest cities – Zagreb and Split), their age (less than 5% were over 50 years old), their education level (with 18% having a PhD), and their sector of employment (8% of them working in the education sector).

Without information on the population size and given the general lack of definite minimum sample size for conducting factor and linear analysis it is difficult to assess with certainty whether this study's sample is adequate for the methods of analysis it used.

According to Mundfrom and Shaw [41], defining an adequate sample for factor analysis includes observing the number of factors, the number of variables per factor (p/f ratio), and the level of communality. Considering this study retained three factors, with a 4.3 p/f ratio and a wide level of communalities (ranging between .2 and .8), an excellent-level criterion would need a sample of 260 respondents, while a good-level criterion would need 120 respondents [41] which leads to the conclusion that a sample of 158 respondents is acceptable. In the case of multiple linear regression, sample size can be defined using the precision efficacy analysis for regression (PEAR), which limits the amount of expected shrinkage[2] in R^2 and enhances the cross-validity potential of regression model, combining it with the effects of multicollinearity [42].

[2] As Brooks and Barcikowski put it: "PEAR method can be viewed as cross-validation in reverse. That is, instead of determining by how much the sample will shrink due to the sample size, the PEAR method determines how large a sample is required to keep from shrinking too much" [42, p. 3]

For a successful cross-validation of the R^2 (.222) of this study, with a precision efficacy of .80, while meeting the trivial multicollinearity condition (predictor correlations lower than .30), according to Brooks and Barcikowski [42], the minimum sample size should be 113. Although a larger sample would surely provide a better predictive power of the study's models, a sample of 158 respondents is considered acceptable.

Finally, with regards to the percentage of variance explained by the retained factors in EFA, it should be noted that, although relatively low by some standards [43], three factors explaining 54.5% of variance can be considered acceptable as such percentage is common in social sciences [43].

One last note regarding potential limitations sees the practice of alternating positively and negatively charged items in the constructed scales (see for example items JS1 and JS2 in Table 2.). As Sauro and Lewis [44] and Salazar [45] have shown, alternating positively and negatively oriented questions can often lead to their misinterpretation by respondents or result in coding errors done by researchers. Such complications are seen as outweighing the positive sides brought by an alternation of positive and negative wording, specifically minimizing acquiescence and extreme response biases. Having that in mind, future versions of the scales used in this research will have their wording revised.

7. Conclusion

The initial design of the instrument for researching homeworking experiences of Croatian engineers was made by combining three intertwined categories derived from a review of previous theoretical approaches and research findings on remote work. The first category referred to the *quality of work* from home as a broad concept encompassing the productivity and effectiveness of that kind of work, but also the autonomy of work, in terms of spatial and time organization given to the employees, and the accessibility of colleagues, as well as learning and training opportunities. The second category included in questionnaire design covered issues of relocation of paid work to the private sphere, and possibilities and successfulness in *balancing personal and work life* while working from home. Issues related to *management and control* of homeworking made up the third category, as well as the entailing problems of employers' trust and employees' motivation, and consequentially job satisfaction.

Exploratory factor analysis was used to test the consistency of the instrument and to check and confirm the presence of the predicted categories, i.e. latent constructs. It extracted three factors named *Productivity and work quality*, *Work-life balance* and *Organizations' distrust and control* explaining almost 55% of the total variance. Thus, the initial instrument measuring the attitudes and experiences of working from home with 29 items was shortened to 13 items in total. The multiple linear regression applied in order to predict job satisfaction from the retained three factors as predictors showed that, although work-life balance does not influence job satisfaction, productivity and work quality predict it positively, and organizations' distrust and control negatively and in a greater extent.

Although it is surprising that job satisfaction is not predicted by engineers' work-life balance, especially considering they reported higher amounts of working hours per week, this finding could be considered in line with Falstead and Gesenke's [11], as well as Ojala's [15] results pertaining to research on social exchange theory, which states that employees are indeed willing to work longer hours in exchange for the "flexibility" offered by working from home. On the other hand, the low correlation between work-life balance and job satisfaction could indicate that engineers have higher "tolerance" levels pertaining to permeability and flexibility in terms of border theory [13], being less affected by porous patterns of work, or perhaps more accustomed to it, especially if that kind of arrangements are not novel to them.

The fact that engineers who experience better work quality and productivity while working from home will also report higher levels of job satisfaction is in line with Cascio's [23] and Harker's and MacDonnell's [24] findings of higher productivity in working from home arrangements, and it could very well indicate that engineers find that these kinds of arrangements allow them to better manage their time, while less face-to-face interactions enable them to be more productive, which results in higher satisfaction not only with one's employment, but also with one's work.

Finally, the fact that engineers who experience lower levels of organization's control and distrust towards that kind of working arrangement will be the most satisfied with their jobs is a result that is not only expected, considering research done by de Vaujany [33], but also an important piece of information that should be adopted by employers still subscribing to a (digital) Tayloristic management style.

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