

Employee Happiness in the Industry 4.0 Era: Insights from the Spanish Industrial Sector

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Abstract—In recent years, the study of organizational and employee happiness has become a prevalent and increasingly important research topic in the field of management science. At present, however, there are few studies that aim to examine the happiness of employees working in Industry 4.0 environments. Against this background, and in order to extend scientific progress on the topic, this paper presents a microanalysis of the level of employee happiness of those actively employed in the Spanish industrial sector. A correlational study was carried out using primary data from the barometer of the Center for Sociological Research (CIS). From this data, an ANOVA analysis was completed with results showing that the average rate of happiness for employees is quite high. Observations also revealed that individual employee happiness is directly linked to personal income and not from factors surrounding homelife.

Keywords—Industry 4.0; Employee Happiness; Spanish Case Study; Income; Work-life Balance.

I. INTRODUCTION

As Spanish industry continues to become more globalized, one of the main concerns for Human Resource (HR) departments is how to mitigate the employment risks associated with the Industry 4.0 era [1, 2, 3]. One such risk is the ability to recruit capable human capital that are able to meet changing workplace requirements, such as the need for improved visual thinking, creativity, social relations, accelerated learning and workplace happiness [4]. To mitigate this challenge, companies are beginning to: implement management models that are focused on people; establish collaborative working cultures; design hybrid organizational models between human and manufacturing capital; or promote social leadership, based on the holistic pursuit of subjective well-being [5, 6, 7, 8]. Among these challenges, one of the most important for corporate progression is the retention and loyalty of innovative and creative employees [9]. To achieve this, companies must proactively pursue and engage in endomarketing strategies that encourage employee satisfaction and the cultivation of positive climates within organizations, which ultimately reduce or limit staff turnover [10, 11, 12].

II. LITERATURE REVIEW

In order to meet the challenges of the digital economy, it is crucial that executives of Spanish companies incorporate

governance centered business models, holistically increasing operational productivity, disruptive innovation and workplace performance [13, 14]. With regard to the latter, it should be noted that this encapsulates multiple factors, including the retention of employees through the implementation of actions aimed at creating multidisciplinary and intercultural working teams, and a management focus that is on the increase of creativity and organizational happiness, which ultimately drive sustainable competitive advantage [15, 16, 17]. Further, it is important that employees feel happy in their workplace. The ability for oneself to feel happy in the workplace often depends on personal perceptions towards individual productivity and in reputations inside and outside of the company. The internal relationships that occur in organizations and the degree of happiness that can be acquired not only is related to human relations, but can also be influenced by actions and perceptions of colleagues; these can provide reactions that favor or affect the behavior of individuals [18]. However, it has been studied that the internal relationships that emerge during teamwork also impact on the happiness of an employee. In addition, friendship and camaraderie are seen to provide evidence of endorsement and recognition that influences happiness. Cooperation between members of a workgroup when achieving objectives also guarantees efficiency, as well as recognition [19], which can transcend into feelings of personal accomplishments.

It is worth mentioning that happiness also lies in the internal relationships that emerge between colleagues, and in the security the employee feels i.e., is there position stable with no concerns. This perception often guarantees commitment to organizational vision and growth strategies. Then, the perception of internal happiness, based on stability, recognition, and retribution for the work realized significantly confirms that happiness is achieved through job security, which stimulates commitment to comply with the activities and policies established in the organization [20]. This could be more relevant than only perceive economic retribution [21]; in addition, self-awareness, through the development of skills and practice, often improves internal relationships and helps establish autonomy in the workplace [22].

Competence depends on the relationships that occur in the organization and as a proposal to reach new goals. Working conditions influence the stimulus that employees perceive in the development of activities that lead to visible progress. The

creation of a positive working environment could also increase confidence and security in employees by bringing an evident state of well-being that allows them to be free to actively participate. With this action, employees have the opportunity to demonstrate their skills inside and outside work, otherwise, it is possible that they will not find a state of well-being, disfavoring the ability and desire to be competent inside the firm [23]. To guarantee the well-being of workers, it is important to understand the development of activities against their performance capabilities. This strategy creates a gap that affects meeting the needs in each work area in which it is developed and where interaction between colleagues drive happiness [24].

Since the beginning of the 21st century, there has been a significant amount of research conducted into the link between employee productivity and happiness [25, 26, 27], however, there are few studies that have explored this construct in the context of different branches of economic activity (e.g., agricultural, industrial and services). Therefore, it is important that we conduct further studies into the different contexts to understand which industrial sectors impact corporate happiness most greatly. For this reason, this article explores whether technology-based companies show the highest rates of employee happiness. We aim to develop a transparent picture of happiness levels in the Spanish industrial sector during the time of the Industry 4.0 era, as well as to describe the influence of social factors, such as money and homes, in developing the happiness of people who work in one of the most innovative and productive sectors during the year 2018-19 [28].

The influence of technological advancements on methods of production and consumption have been the subject of numerous academic and social debates in recent years, due to their effects on employment, the environment and consumption. Presently, the second and third industrial revolutions, promoted by new information and communication technologies, are in full force. We now observe the dawn of a new industrial revolution, Industry 4.0, which focuses on the computerization of manufacturing processes, advancing digitization within factories through cyber-physical systems, and creating smart factories, based on interconnected devices. This new era of manufacturing relies on the Internet of Things (IoT) and cloud-based technologies to automate traditionally manual manufacturing processes, such as casting, molding, forming and machining. By automating production, organizations envisage lower manufacturing and supply chain costs, improved product quality and reduced defects, and increased product innovation.

With envisaged benefits, however, comes the old debate of the impact of automation on production and employment. In the 18th and 19th centuries, during the first industrial revolution, English artisans led protests against the industrial revolution due to the perceived threats they posed to employment. Later, during the 1930s, at the beginning of the second industrial revolution, John Keynes predicted that technological advancements would lead industrialized countries to better living conditions and a reduced working day. However, experts now warn that new technological advancements present major threats to employment and our everyday lives. For example, when Carl Frey and Michael Osborne of the Oxford Martin School studied changes in workplace innovations, they predicted a 47% risk for jobs in the United States due to automation [29]. Some

researchers have also estimated that 1,100 million employees worldwide will be affected due to their jobs becoming technically automatable. In Europe, the number of occupations with a high risk of automation is estimated to be 54 million.

In the book "The rise of the robots" by Martin Ford [30], or the report of Citi GPS, Global Perspectives & Solutions, it was identified that there will be three important effects of automation on society and the economy: (1) greater acceleration of the pace of technological change; (2) greater scope of technological change; and (3) the benefits of technological change will not be broadly shared in society because real average wages have lagged behind compared to the growth of productivity and economic and social inequalities have increased. In this way, the development of artificial intelligence poses a real threat to humanity. More recently, economist Zia Qureshi [31] stated that "the modernization of economies has not always brought about an improvement in the lives of citizens: policies must be adapted to promote productivity, but also equity and social justice".

There appears to be little doubt that the pace of technological change has accelerated. While it took 119 years for the spindle (instrument used for hand spinning) to spread outside of Europe, the Internet has spread worldwide in just 7 years. These changes will continue to advance as costs related to innovation continue to decline. Consequently, online connectivity shows an accelerated growth while a new stage in connectivity emerges: the connectivity of 'Things'; e.g., Cisco Systems estimate that 500 billion devices will be connected in 2030, compared to 13 billion in 2013. These increases in connectivity are driving an exponential increase in data, which is duplicated every 18 months. The effects of applying the IoT and Industry 4.0 technologies to industrial and manufacturing processes constitute the 4th Industrial Revolution.

III. METHODOLOGY

This paper employs a correlational study using survey data from the barometer of the Center for Sociological Research (CIS), obtained in September 2018 [32]. The scope of the study is national, in the context of Spain, involving a sample of both sexes, from 18 years of age. The sample size is 2,972, from 292 municipalities and 50 provinces. The sampling procedure involved a multi-stage process, stratified by conglomerates, with a selection of primary sampling units (municipalities) and secondary units (sections) of random proportional form, and of the last units (individuals) by random routes, Sex and age quotas.

The strata was formed by the crossing of 17 autonomous communities with the size of habitat divided into 7 categories: (1) Less than or equal to 2,000 inhabitants; (2) From 2001 to 10,000; (3) From 10,001 to 50,000; (4) From 50,001 to 100,000; (5) From 100,001 to 400,000; (6) From 400,001 to 1,000,000; and (7) More than 1,000,000 inhabitants. Questionnaires were applied through personal interviewing at the first author's home during September 2018 with a sampling error of $\pm 1.8\%$ for the whole sample and, in the case of simple random sampling, had a confidence level of 95.5% (two sigmas), and $P = Q$.

The main objective of this study was to analyze the degree of happiness in Spanish industry during 2018. Specifically, it focused on establishing if there were any significant differences in levels of happiness depending on the different branches of

activity (i.e., agricultural, industrial and services), as well as studying to what extent other labor variables can significantly affect the happiness of Spaniards working in industry. To achieve this, the dependent variable ‘P6’ was used. The question posed was: To what extent do you consider yourself a happy or unhappy person? We used a scale of 0 to 10 to analyze the collected data, where 0 means that he/she is “completely unhappy” and 10 is considered “completely happy”. Independent variables were considered “P39”, the branch of activity classified according to the National Classification of Economic Activities (CNAE), and “P41” for personal income. The software used for analysis purposes was SPSS, version 25.

IV. RESULTS

Firstly, an ANOVA Analysis [33] was carried out to verify if there were any significant differences between the degree of happiness, according to the branch of activity. Next, a ranking was developed for showing the branches in which Spaniards feel most and least happiness, as shown in Table 1 and 2.

TABLE I. DESCRIPTIVE STATISTICS OF THE DEGREE OF HAPPINESS ACCORDING TO INDUSTRIAL BRANCH BY THE CLASSIFICATION OF ECONOMIC ACTIVITIES (CNAE) SCALE OF PERSONAL HAPPINESS (0-10)

<i>Industrial Activity Branch</i>	<i>N</i>	<i>Mean</i>	<i>Std. Deviation</i>	<i>Deviation Error</i>
Other manufacturing industries	16	10,00	23,033	5,758
Manufacture of other non-metallic mineral products	27	10,00	17,519	3,372
Food industry	77	8,82	10,440	1,190
Metallurgy: manufacture of iron products, steel etc.	59	8,39	12,133	1,580
Repair and installation of machinery and equipment	7	8,14	0,900	0,340
Extraction of crude oil and natural gas	1	8,00		
Manufacture of pharmaceutical products	10	8,00	1,633	0,516
Manufacture of rubber and plastic products	11	7,82	1,601	0,483
Coke and oil refining	5	7,60	0,548	0,245
Beverage manufacturing	7	7,57	2,299	0,869
Other extractive industries	9	7,56	1,424	0,475
Manufacture of machinery and equipment.	14	7,43	1,604	0,429
Paper industry	11	7,36	2,693	0,812
Manufacture of other type of transport material	16	7,25	1,653	0,413
Manufacturing of computer, electronic and optical products	5	7,20	1,095	0,490
Manufacture of motor vehicles, trailers and semitrailers	31	7,19	1,957	0,351
Chemical industry	28	7,18	1,906	0,360
Wood and cork industry, except furniture.	13	7,15	1,864	0,517
Textile and clothing industry	38	7,05	1,972	0,320
Fisheries and aquaculture	26	7,00	1,939	0,380
Extraction of metallic minerals	1	7,00		
Furniture manufacturing	12	6,92	1,564	0,452
Making of clothes	11	6,91	2,468	0,744
Graphic arts and reproduction of recorded media	15	6,87	2,356	0,608
Manufacture of metal products, except machinery	28	6,86	2,337	0,442
Leather and footwear industry	25	6,84	2,135	0,427
Manufacture of electrical equipment and materials	16	6,50	2,556	0,639
Extraction of anthracite, coal and lignite	7	6,14	2,116	0,800

TABLE II. ANOVA HAPPINESS SCALE ANALYSIS ACCORDING TO THE BRANCH OF INDUSTRIAL ACTIVITY

	<i>Sum of Squares</i>	<i>df</i>	<i>Quadratic Mean</i>	<i>F</i>	<i>Sig</i>
Between groups	3810,811	85	44,833	0,757	0,951
Within groups	170813,402	2886	59,187		
Total	174624,214	2971			

Although no significant differences exist between the level of happiness of employees working in the different branches of industry ($F > 0.05$), it can be seen that the average, per branch of activity, moves in a range of 10 to 6, 14, that is, to feel completely happy to a good happiness.

The branches with an average of outstanding happiness is “Other manufacturing industries” and “Manufacture of other non-metallic mineral products”. Those experiencing remarkable happiness are those associated with the majority of industrial activities, including “Food industry”; “Metallurgy; manufacture of iron, steel products etc.”; “Repair and installation of machinery and equipment”; “Extraction of crude oil and natural gas”; “Manufacture of pharmaceutical products”; “Manufacture of rubber and plastic products”; “Coke and oil refining”; “Manufacture of beverages”; “Other extractive industries”; “Manufacture of machinery and equipment”; “Paper industry”; “Manufacture of other type of transport material”; “Manufacture

of computer, electronic and optical products”; “Manufacture of motor vehicles, trailers and semi-trailers”; “Chemical industry”; “Wood and cork industry, except furniture”; “Textile and clothing industry”; “Fishing and aquaculture” and “Extraction of metallic minerals”. Finally, the branches with the lowest degree of happiness, although with a good level of happiness, are the “Manufacture of furniture”; “Making of clothes”; “Graphic arts and reproduction of recorded media”; “Manufacture of metal products, except machinery”; “Leather and footwear industry”; “Manufacture of electrical equipment”; and “Extraction of anthracite, coal and lignite.”

Next, an analysis of correlations of the variable “P6”, happiness scale with respect to the income variable, that is, “P41” personal income, was completed, as shown in Table 3.

TABLE III. CORRELATION BETWEEN PERSONAL HAPPINESS AND INCOME

		<i>Scale of personal happiness (0-10)</i>	<i>Interviewed of the person income</i>
Scale of personal happiness (0-10)	Pearson Correlation	1	,92*
	Sig (Bilateral)		0,041
Interviewed of the person income	Pearson Correlation	,92*	1
	Sig (Bilateral)	0,041	

* The correlation is significant at the 0.05 level (bilateral).

There is a positive and significant correlation at 95% confidence between the income of the person interviewed and the happiness scale, since the Pearson correlation is 0.92. This indicates that when a person receives a higher personal income, they also achieve a higher level of happiness. It is also observed that there is a correlation between the happiness scale and the household income.

V. CONCLUSIONS

People employed in the Spanish industrial sector are seen to generally feel happy with their workplace experiences during 2018. Specifically, findings show that there are a few sectors with good happiness levels, with most expressing remarkable happiness. We also found a couple of branches, including “Other manufacturing industries” and “Manufacturing of other non-metallic mineral products”, that were completely happy.

In relation to our correlation analysis, it was found that what really makes Spanish employees happy was their personal income; however, there is no correlation with household income. This shows a parallelism with Maslow’s Hierarchy of Needs, where the primary need of the pyramid is “household

income” and that, in a developed country like Spain, this would be covered. On the other hand, the highest needs of the pyramid, known as self-realization, are those that bring true happiness, here we find the parallelism with “the income of the person interviewed”. One of the limitations of the present study is that it is a cross-sectional investigation, considering primary data of the CIS barometer in September 2018. In future, this could be extended to a longitudinal study considering several periods of time. It could also be extended to the tertiary (services) and / or primary (agriculture and livestock) sectors. Finally, the inclusion of other variables, such as age, gender, economic sub-sectors, educational level and knowledge requirements for job performance could be studied to compare the perceptions of happiness; to this end, the authors of this paper are preparing a study that will include a greater number of variables, besides income.

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