

Validation of the JDS Satisfaction Scales Applied to Educational University Environments

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Abstract:

Purpose: The aim of this study is to review and summarize the main satisfaction scales used in publications about human Resource Management and educational research, in order to adapt the satisfaction scales of the Job Diagnostic Survey (JDS) to higher education and validate it with a sample of university students and to assess the concept of satisfaction in two different ways: as a single-item measure, with a global indicator and as a multi-item measure, analyzed as a global model and composed by several scales.

Design/methodology/approach: Confirmatory factor analysis with maximum likelihood, using structural equations model, was employed to assess the model fit in 152 business management undergraduates.

Findings and originality/value: The satisfaction model measured as multi-item scale present an acceptable fit. Even though, some of the satisfaction scales did not present a satisfactory fit, they can be used and interpreted independently with carefulness. Nevertheless, the satisfaction single-item scale presents a better fit and has been validated as a simpler and less costly measure of satisfaction.

Originality/value In the current process of change that is taking place in universities according to the plan developed by the European Space of higher Education, validated instruments as the satisfaction scale of JDS, adapted to teaching, may facilitate this process through the diagnosis, and follow-up of changes in satisfaction levels in university classrooms.

Keywords satisfaction, higher education, JDS, university, SEM, EQS

1. Introduction

The analogy between the academic world and the enterprise world was proposed over 20 years (Berliner, 1983, en (French & Chopra, 2006)), however has been in recent years that it has been studied in various disciplines (Freed, 2005; Armstrong, 2003; Donaldson, 2002; Martínez-Gomez & Marin-Garcia, 2009; O'Neil & Hopkins, 2002), especially in business management and engineering. This analogy is represented by the possibility of seeing a teacher as a leader who creates the appropriate conditions for learning (Freed, 2005), managing, organizing, and monitoring students achievements (French & Chopra, 2006). A leader who manages a group of people to develop actions to improve the students "workplace" (Martínez-Gomez & Marin-Garcia, 2009).

These aspects are related to student motivation and directly influence their satisfaction (Adler, Milne & Stablein, 2001). However, within the literature on the area, the student satisfaction has traditionally been measured by contextual factors that are not inherently related to the learning process and the quality of teaching (Brennan, Brighton, Moon, Richardson, Rindl & Williams, 2003; Martínez-Gómez, Carot Sierra, Jabaloyes & Zarzo, 2011), supported mainly in consumer theory.

Given that job satisfaction questionnaires intend to analyze and determine the aspects or facets that are included and/or related in it taking into account several processes like motivation and, we have not been able to find an instrument that assess student satisfaction through learning, and also identify and facilitate the modification of different aspects of satisfaction, the aim of this study is to adapt and validate to the academic world, a widely used tool in the workplace (Job Diagnostic Survey, JDS) (González, 1997; Hackman & Oldham, 1980), which has been used to evaluate the motivating potential of the workplace (Freed, 2005; Griffin, 1991), making a diagnosis to determine how they can be redesigned so as to promote the motivation and satisfaction of employees. We pretend to extrapolate these aspects to a sample of students.

This aim is part of a larger study and complex theoretical model of the same instrument (JDS) including job characteristics as a related variable.

2. Student satisfaction

Among the available instruments to measure student satisfaction, the most commonly used are the student satisfaction survey (SSI) (Bryant, 2006; Elliott & Shin, 2002; Kress, 2006), developed by the American group Noel-Levitz. The University Student's Motivation, Satisfaction, and Learning Self-Efficacy Questionnaire version 3 (TUSMSLSEQ3) (Afzal, Ali, Aslam Khan & Hamid, 2010), developed by the University of Camberra. The Service Quality Model (SERVQUAL) (Al-Alak, 2009; Arambewella & Hall, 2009; Douglas & McClelland, 2007; Standifird, Pons & Moshavi, 2008), the Student Evaluation of Educational Quality Questionnaire (SEEQ) (Coffey & Gibbs, 2001), and the "Cuestionario de Satisfacción Académica" (CSA) (Soares, Guisande, Diniz & Almeida, 2006).

Other instruments with less widespread use, are the Undergraduate Business Exit Assessment (UBEA) (Letcher & Neves, 2010; Gibson, 2010), the Business Student Satisfaction Inventory (BSSI) (Maddox & Nicholson, 2008) and the Utrecht Student Monitor (USM) (Möller, 2006). These instruments have been validated in more specific samples and its use is not as widespread as the first ones.

In summary, there are many and varied instruments to measure academic satisfaction (Aldemir & Gülcan, 2004; Alves & Raposo, 2009; Beecham, 2009; Chumney & Ragucci, 2006; DeShields, Kara & Kaynak, 2005; Douglas, Douglas & Barnes, 2006; Duque & Weeks, 2010; Endres, Chowdhury, Frye & Hurtubis, 2009; Fernández Rico, Fernández Fernández, Álvarez Suárez & Martínez Camblor, 2007; Gaskell, 2009; Gremler & McCollough, 2011; Gruber, Fuss, Foss & Gläser-Zikuda, 2010; Kanno & Koeske, 2010; Lawrence & McCollough, 2003; Marozzi, 2009; Parayitam, Desai & Phelps, 2007; Pascual Gómez, 2007; Pop, Băacilă, Moisescu & Țîrca, 2008; Roberts & Styron, 2010; Van Schaick, Kovacik, Hallman & Morrison, 2007; Wilson, 2008; Hill & Epps, 2010; Liu, Borg & Spector, 2004; Marzo Navarro, Pedraga Iglesias & Rivera Torres, 2004), however, these instruments are focused primarily on trying to understand the student's perceptions regarding the quality of service offered on campus, the library, classrooms, etc.. (Arambewella & Hall, 2009), or students surveys for the evaluation of lecturers, the teaching quality or the lecturers' performance and activities (Martínez-Gómez et al., 2011).

3. Job satisfaction

The concept of job satisfaction, studied for more than 50 years (van Saane, Sluiter, Verbeek & Frings-Dresen, 2003), it is one of the most investigated concepts within the human resources area (Kaplan, Warren, Barsky & Thoresen, 2009; Kinicki, McKee-Ryan, Schriesheim & Carson, 2002; Oshagbemi, 1999), within the extensive literature on this topic, there are several definitions that can be found. Among them the most common are those of Locke's (1976)

which describes it as an emotional-affective response to a job or to specific aspects of it, or the Smith's (Smith, Kendall & Hullin, 1969) where job satisfaction is a feeling or an emotional response to a job facets. However, a theoretically more consistent and more precise definition is that of Weiss (2002), who defines it as an attitude, this is as a "positive or negative, evaluative judgment" towards a job or a situation within this.

Likewise, job satisfaction is made up of two components that define the form in which it will be measured: the cognitive component and the affective component (Kaplan et al., 2009). The affective component refers to the feelings generated for an object, in this case to work, and the cognitive, reflecting the thoughts and beliefs about that object or work. These components may have a correlation between them, but are two independent processes (Weiss, 2002). This distinction is important since it is the theoretical basis from which emerge the instruments that assess job satisfaction.

The vast majority of these instruments are cognitive in nature, focusing on the judgments and beliefs of individuals and do not assess the affective component. The instruments most used to measure job satisfaction are the Job Descriptive Index (JDI) (Stanton, Bachiochi, Robie, Perez & Smith, 2002; Abdulla, Djebarni & Mellahi, 2011; Boswell & Boudreau, 2000); the Minnesota Satisfaction Questionnaire (MSQ) (Weiss, Dawis, England & Lofquist, 1967; Zeffane, Ibrahim & Al Mehairi, 2008; Kaplan et al., 2009); The Job Diagnostic Survey (JDS) (Hackman & Oldham, 1975; Oldham, Hackman & Pearce, 1976; Kumar, Abbas, Ghumro & Zeeshan, 2011), and the Warr's Job Satisfaction Scale (WJSS) (Warr, Cook & Wall, 1979). In the Spanish language, the instruments developed by Meliá & Peiró, like the S20/23 (Meliá & Peiró, 1989), are the most used (Sánchez-Anguita, Conde, De la Torre & Pulido, 2008; Chiang Vega, Salazar Botello & Núñez Partido, 2007).

In the health sector, there are countless instruments for measuring job satisfaction. Here we have selected one of the most cited as the Mueller McCloskey Satisfaction Scale (MMSS) (van Saane et al., 2003; Ellenbecker & Byleckie, 2004; Rickard, Roberts, Foote & McGrail, 2007). Furthermore, in this sector, we found specialized instrument to measure the job satisfaction in nurses as the Nurse Assistant Job Satisfaction Questionnaire (NH-CNA-JSQ) (Castle, 2010), and the Nurses' Job Satisfaction Scale (Ellenbecker & Byleckie, 2004), among others.

There are other questionnaires which have been used in several studies, but not with the same frequency, such as the Index of Work Satisfaction (IWS) (Jernigan, Beggs & Kohut, 2002; Manojlovich, 2005); the Multimethod Job Design Questionnaire (MJDQ) (Edwards, Scully & Brtek, 1999); the Michigan Organizational Assessment Questionnaire (MOAQ) (Spector, Allen, Polemans, LaPierre, Cooper, O'Driscoll, et al., 2007); the "*escala general de satisfacción*" (NTP 394) (Alonso Martín, 2008; Díaz Echenique, Stimolo & Caro, 2010); and the International Social Survey Program (ISSP) (Huang & van de Vliert, 2003).

Other questionnaires found with a scarce use in the literature are the Jobsat survey (Westover, Westover & Westover, 2010); the Dubai Job Satisfaction Survey (Abdulla et al., 2011); the Work Motivation and Job Satisfaction Scale (WMJSS) (Saleem, Mahmood & Mahmood, 2010); the German Job Satisfaction Survey (GJSS) (Liu et al., 2004); the WES-10 (Workplace and Employee survey) (Rossberg, Eiring & Friis, 2004); the Work Environment Survey (WES) (Houston, Meyer & Paewi, 2006); the European Employee Index; the Occupational Stress Indicator 2 (OSI2) (Spector & Fox, 2003); and the “*encuesta de satisfacción de las personas*”, created by “*Servicio Vasco de Salud*” (Osakidetza) (Robles-García, Dierssen-Sotos, Martínez-Ochoa, Herrera-Carral, Rosa Díaz-Mendi & Llorca-Díaz, 2005).

In education, there are the Teaching Satisfaction Scale (Demirtas, 2010; Ho & Au, 2006), the “*Escala de Satisfacción Laboral en la Dirección Escolar*” (Tejero-González & Fernández-Díaz, 2009) and the scale developed by Nicolescu, Dima, Anghel & Paun (2009). However, these instruments were created to evaluate the satisfaction in teachers and not in students.

Also, there are several instruments to measure the employees satisfaction, which have been developed or applied only in singular studies and little is known about them (Abrajan Castro, Contreras Padilla & Montoya Ramírez, 2009; Bos, Donders, Bouwman-Brouwer & Van der Gulden, 2009; Boswell, Boudreau & Tichy, 2005; Gu & Chi Sen Siu, 2009; Huang & van de Vliert, 2003; Kochar, 2008; Mañas, Salvador, Boada, González & Agulló, 2007; Niklas & Dormann, 2005; Roelen, Koopmans & Groothoff, 2008; Ssesanga & Garrett, 2005; Yang, 2010).

Most of above mentioned instruments are composed of several items grouped into scales that assess different aspects of a job. This is known as multi-item/multi-scale measures, and is one of the ways in which satisfaction is usually measured. The other way is by means of a single indicator that assesses the degree of perceived overall satisfaction (single-item scale) (Oshagbemi, 1999).

Table 1 shows the most used instruments according to the times they have been cited, assessed scales and internal consistency. The most used instrument is the JDS with 4037 cites followed by the JDI (3272), the MSQ (1685), the WJSS (1263), the JSS (609), the MMSS (305), and finally the Spanish questionnaire S20/23, with 68 cites. These instruments are multi-scale measures that assess several aspects of the job, and even though there are many other scales included in the different questionnaires (for instance, the MSQ), the most frequently used in the satisfaction questionnaires are satisfaction with pay, work (from different perspectives), supervision, promotion, co-workers, and to a lesser extent other rewards.

	MSQ (Weiss, 1967)	JDI (Smith, 1969)	JDS (Hackman & Oldham, 1975)	WJSS (Warr, Cook & Wall, 1979)	JSS (Spector, 1985)	S20 \ 23 (Melía & Peiró, 1989)	MMSS (Mueller & McCloskey, 1990)
Number of citations (Extracted from Google Scholar).	1685	3272	4037	1263	609	68	305
Scales included							
Benefits					0.73		
Pay	0.91	0.80	0.82(b)		0.75	0.76-0.89 (satisfaction with facilities)	0.89(a) (Safety)
Work		0.81			0.78	0.76-0.89 (intrinsic satisfaction)	
Promotion	0.93	0.84			0.73	0.76-0.89 (benefits)	
Supervision	0.86	0.84	0.79		0.82	0.76-0.89	
Coworkers	0.85	0.85	0.56 (Social satisfaction)	0.80-0.82	0.60		0.89 (a) (Social rewards)
Contingent Rewards	0.93 (Recogn- ition)				0.76		0.89(a) (Psychological rewards)
Company Policies	0.90						
Communication	X				0.71		
Ability utilization	0.91						
Activity	0.86						
Authority	0.85						
Creativity	0.87						
Growth			0.84	0.82-0.91 (Higher order need strength)			
Independence	0.85						
Internal work motivation			0.76	0.82 (Intrinsic job motivation)			
Moral values	0.81						
Operating Procedures					0.62		
Responsibility	0.78						0.89(a) (Psychological rewards)
Security	0.80		0.62(b)				
Social service	0.89						
Social status	0.79						
Variety	0.86						
Working Conditions	0.89			0.58-0.60		0.76-0.89 (physical environment satisfaction)	
Perceived intrinsic job characteristics				0.86			
Scheduling							0.89(a) (family/work balance)
General Satisfaction			0.76	X			
Total life satisfaction				0.78			
Happiness				X			
Self-rated anxiety				0.68-0.74			

Table 1. Satisfaction scales, times cited and internal consistency (Cronbach alpha). (a) Total scale reliability in Van Saane et al. (2003). (b) Indices found in Oldham et al. (1976)

According to its principal authors, most of the scales presented here show satisfactory reliability indices, except for the co-workers (0.60) and operating procedures (0.62) scales from the JSS, and working conditions (0.58-0.60) from the WJSS, which are slightly below the recommended value (0.70).

There is no agreement on the best way to measure satisfaction. There are several arguments for and against single item or multi-scale/multi-item (Bergkvist & Rossiter, 2007; Hernández Maestro, Muñoz Gallego & Santos Requejo, 2008; Oshagbemi, 1999; Marin-Garcia, Bonavia & Losilla, 2011). On the one hand, single-item scales occupy less space, are less expensive and may be a better measure of job satisfaction change, while the multi-item scales provide more information on the facets of satisfaction, and can be determined their reliability and validity (Nagy, 2002).

In summary, we pretend first, to validate the JDS satisfaction scales adapted to the university teaching version and secondly, to test the satisfaction in two different ways: as a single-item measure (Figure 1a), composed by the S3P03 item and as a multi-factor/multi-item (Figure 1b) composed by the internal work satisfaction, growth satisfaction, satisfaction with grades, satisfaction with security, satisfaction with supervision and social satisfaction as a first order scales with several items each one.

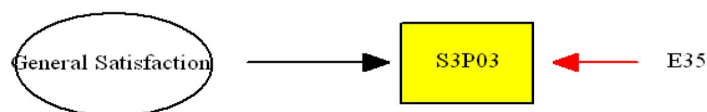


Figure 1a. Satisfaction Models tested. Single-item scale

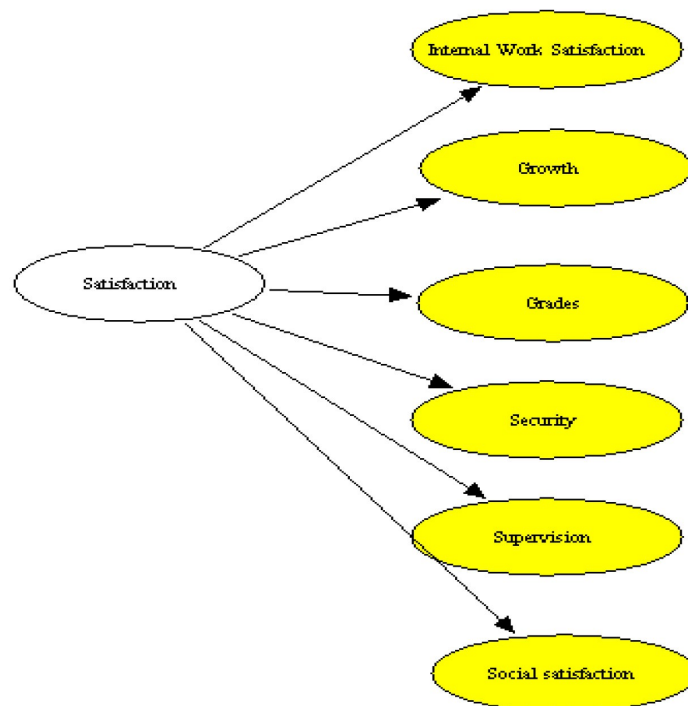


Figure 1b. Satisfaction Models tested. Multi-factor/multi-item scale (items of scales are not included in the diagram)

4. Method

4.1. Participants

Data was collected from 152 business management undergraduates, from a public University in Spain, in the 2008-2009 academic year. The data were obtained from 27 different subjects, covering 5 career courses. The instrument was administered directly in the classroom, where the pollster asked volunteers to answer the survey.

4.2. Measures

We have used the JDS questionnaire adapted to university teaching (Martínez-Gomez & Marin-Garcia, 2009), based on JDS Spanish version by Fuertes Martinez, Munduate Jaca and Fortea Bagán (1996).

The model consists of four scales that measure the job satisfaction in a seven-points likert scale where higher levels mean more satisfaction. The model scales are: General satisfaction, including one item; internal work motivation, including six items; Growth satisfaction, including 4 items, satisfaction with grades (two items), satisfaction with security (two items), social satisfaction (three items) and satisfaction with supervision (three items). Table 2 presents the scales definitions of the adapted JDS student questionnaire.

Scale	Adapted Definition	Items
General satisfaction	An overall measure of the degree to which the student is satisfied and happy with the job.	(S3P03)
Internal work motivation	The degree to which the student is self-motivated to perform effectively on the job-that is, the student experiences positive internal feelings when working effectively on the subject, and negative internal feelings when doing poorly.	[(S3P02) + (S3P06) + (S3P10) + (S3P14) + (S5P01) + (S5P09)] / 6
Growth	Growth-need strength refers to workers' needs for personal accomplishment, for learning, and for developing themselves beyond where they are at present.	[(S4P03) + (S4P06) + (S4P10) + (S4P13)] / 4
Satisfaction with grades	Refers to the degree of satisfaction with basic compensation and benefits (course marks) as well as satisfaction with the extent to which the marks relates to the individual's contribution to the organization.	[(S4P02) + (S4P09)] / 2
Satisfaction with security	Degree of satisfaction with the amount of general security experienced to pass the course.	[(S4P01) + (S4P11)] / 2
Social satisfaction	The degree of satisfaction with other students with whom contact is made in the subject, as well as satisfaction with opportunities to get to know and to help people	[(S4P04) + (S4P07) + (S4P12)] / 3
Satisfaction with supervision	The degree of satisfaction with the treatment, support and guidance received from supervisors (professors), as well as the degree to which the general quality of supervision is considered satisfactory.	[(S4P05) + (S4P08) + (S4P14)] / 3

Table 2. Scales definitions of the JDS university student questionnaire. Source: (Martínez-Gomez & Marin-Garcia, 2009; Marin-Garcia, Martínez-Gómez & Lloret, 2009)

4.3. Analysis

To analyze convergent validity, the reliability of the scales was assessed by the Cronbach alpha and the compound reliability (greater than 0.7). It also were checked the loads of items and goodness of fit of the confirmatory model, and the extracted variance (greater than 0.5). In order to confirm the discriminant validity, we used the extracted variance versus the squared correlation test (Fornell & Larcker, 1981) as well as by the correlations confidence interval (Anderson & Gerbing, 1988).

Confirmatory factor analysis with maximum likelihood, using structural equations model (EQS 6.1 software), was employed to assess how well the data fit the model. Although the size sample is not too large, the statistical χ^2 is very sensible to deviations of normality and the size of sample, therefore, other indices have been considered. The Goodness of Fit Index (GFI) and the Adjusted Goodness of Fit Index (AGFI) vary from 0 to 1 and should be equal to or greater than .90 to accept the model. The Comparative Fit Index (CFI) should also be at least .90. Normed fit index (NFI) of Bentler and Bonnet (1980), which varies from 0 to 1, and values below .90 indicate a need to respecify the model. The index of non-normed adjustment (NNFI) considers the degrees of freedom when dividing the value of the chi-square by the degrees of freedom of the model and must be near to 0.9 for a good adjustment. Also the root mean square of approximation (RMSEA) was analyzed, and measures the amount by which the sample variances and covariances differ from the corresponding estimated variances and covariances. The value should be less than 0.08 (Ullman & Bentler, 2004). The R^2 coefficient (descriptive measure between zero and one, indicating how good one term is at predicting another), was used as a measure in those cases where the goodness of fit indexes cannot be obtained.

5. Results and discussion

Table 3 shows the means, standard deviations, skewness and kurtosis measures of the items included in the questionnaire. All items included present average values, except S4P11 (satisfaction with security) by having the lowest mean and S3P06 (internal motivation) whose mean exceeds the value of 5. All items have sufficient dispersion, with standard deviations between 1.296 (lowest) and 1,902 (highest), that, according to Doval and Viladrich Dieguez Dieguez Segué (Doval Dieguez & Viladrich Segué, 2011), are acceptable values when the response scale is 1 to 7.

According to the reliability test (table 4), the Cronbach alpha for all the scales is satisfactory, except in social satisfaction (0.602) where also, items show a low correlation between them (0.357, 0.402 and 0.481). This happens also in items S3P10, S3P14, S5P01 and S5P09 from the internal motivation scale.

These results are consistent with those in the Hackman and Oldham's original version, where social satisfaction scale showed a low internal reliability (0.62), meanwhile the other scales presented an excellent reliability.

Scale	Item code	Descriptive data							
		N	Range	Min	Max	Mean	s.d	Skewness	Kurtosis
General satisfaction	S3P03	143	6.00	1.00	7.0	4.5105	1.902	-0.524	-0.761
Internal work motivation	S3P02	143	6.00	1.00	7.00	5.6503	1.44991	-1.590	2.417
	S3P06	143	6.00	1.00	7.00	5.8112	1.51030	-1.714	2.656
	S3P10	142	6.00	1.00	7.00	5.1972	1.54937	-0.997	0.402
	S3P14	142	6.00	1.00	7.00	4.2465	1.79513	-0.220	-1.027
	S5P01	141	6.00	1.00	7.00	5.1418	1.44707	-1.026	0.730
	S5P09	140	6.00	1.00	7.00	4.5429	1.46602	-0.308	-0.425
Growth	S4P03	137	6.00	1.00	7.00	4.7080	1.52990	-0.620	-0.057
	S4P06	138	6.00	1.00	7.00	5.1304	1.52749	-1.071	0.741
	S4P10	134	6.00	1.00	7.00	4.2015	1.55007	-0.589	-0.357
	S4P13	136	6.00	1.00	7.00	4.6691	1.56373	-0.850	0.427
Satisfaction with grades	S4P02	135	6,00	1.00	7.00	4.1037	1,70283	-0.192	-0.821
	S4P09	137	6,00	1.00	7.00	4.2044	1,65893	-0.527	-0.708
Satisfaction with security	S4P01	138	6,00	1.00	7.00	4.0797	1,77189	-0.242	-0.872
	S4P11	137	6,00	1.00	7.00	3.7153	1,81476	-0.122	-1.071
Social satisfaction	S4P04	137	6,00	1.00	7.00	5.2993	1,29686	-0.883	0.861
	S4P07	136	6,00	1.00	7.00	4.6471	1,38526	-0.582	0.301
	S4P12	137	6,00	1.00	7.00	4.7664	1,45148	-0.755	0.268
Satisfaction with supervision	S4P05	136	6,00	1.00	7.00	5.5074	1,82978	-1.282	0.583
	S4P08	137	6,00	1.00	7.00	4.9562	1,73573	-0.745	-0.272
	S4P14	136	6,00	1.00	7.00	4.3529	1,71066	-0.448	-0.532

Table 3. Satisfaction scales Descriptive statistics

Scale	Item	Item factor loading in CFA analysis	Squared Multiple Correlation	Cronbach's Alpha if item deleted	Cronbach Alpha
Genera Satisfaction	S3P03	0.869	0.740	0.738	n.a.
Internal work motivation	S3P02	0.802	0.633	0.773	0.814
	S3P06	0.837	0.675	0.763	
	S3P10	0.486	0.491	0.803	
	S3P14	0.512	0.550	0.794	
	S5P01	0.649	0.555	0.789	
	S5P09	0.568	0.571	0.786	
Growth	S4P03	0.851	0.766	0.815	0.869
	S4P06	0.828	0.742	0.824	
	S4P10	0.648	0.607	0.878	
	S4P13	0.841	0.776	0.810	
Satisfaction with grades	S4P02	0.859	0.798	n.a.	0.887
	S4P09	0.897	0.798	n.a.	
Satisfaction with security	S4P01	0.784	0.771	n.a.	0.871
	S4P11	0.824	0.771	n.a.	
Social satisfaction	S4P04	0.750	0.481	0.406	0.602
	S4P07	0.467	0.357	0.578	
	S4P12	0.547	0.402	0.518	
Satisfaction with supervision	S4P05	0.751	0.700	0.858	0.867
	S4P08	0.961	0.826	0.739	
	S4P14	0.781	0.719	0.838	

Table 4. Internal consistency of satisfaction scales (n.a.= not available)

Due to the fact that "satisfaction with grades" and "satisfaction with supervision" scales are not identified models, the Cronbach alpha if item deleted and factor loading, could not be calculated.

To check the model validity and reliability, the variance extracted and compound reliability were calculated. The results appear in Table 5. According to the results, the reliability on all scales is above to the cutoff value (0.7), except social satisfaction (0.61). With regard to the extracted variance, internal motivation and especially the social satisfaction (0.36) are below to the recommended value (0.5).

Scale	Compound reliability	Extracted variance
General satisfaction	n.a.	n.a.
Internal work satisfaction	0.81	0.43
Growth	0.87	0.63
Satisfaction with grades	0.88	0.79
Satisfaction with security	0.87	0.77
Satisfaction with supervision	0.87	0.70
Social satisfaction	0.61	0.36

Table 5. compound reliability and extracted variance (n.a.=not available)

Finally, in table 6 are listed the goodness of fit indices of the model. The growth scale presents an excellent fit with all indices according to recommended values (NFI, CFI, AGFI, GFI = 0.9; RMSEA = 0.08), whereas the internal work motivation scale showed low goodness of fit indices, except for the Goodness-of-fit-index (GFI=0.908). Hence, the models were not identified, the goodness of fit indices of the satisfaction with grades, satisfaction with security, satisfaction with supervision and social satisfaction scales were calculated including into the model analysis, a previously validated, well fit scale. In this case we used the growth scale. Satisfaction with grades, satisfaction with security and satisfaction with supervision scales present a good fit, with adequate values, except for the Adjusted Goodness-of-fit-index (AGFI=0.784, 0.799 and 0.815, respectively), and the RMSEA, that it is slightly above of 0.10.

Scales	No. of items	Chi square	Freedom degrees	NFI	CFI	AGFI	GFI	RMSEA
General satisfaction	1	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Internal work satisfaction	6	26.849	9	0.828	0.873	0.784	0.908	0.120
Growth	4	2.3039	2	0.984	0.998	0.943	0.989	0.034
Satisfaction with grades	2	26.1680	8	0.922	0.944	0.784	0.918	0.132
Satisfaction with security	2	24.3530	8	0.927	0.949	0.799	0.923	0.124
Satisfaction with supervision	3	31.0782	13	0.909	0.944	0.815	0.914	0.103
Social satisfaction	3	27.2617	13	0.896	0.941	0.856	0.933	0.092

Table 6. Goodness of fit indices (n.a.= not available)

The results obtained in the previous statistical analysis, show several problems in the analyzed scales through different tests. In the original adapted scales, the section 5 (S5) items, included in internal work motivation scales, present an R2 very low, which leads to a distortion within them. Same occurs in the items S3P14 and S3P10 within the latter.

Regarding of social satisfaction scale, the scale items show a very low correlation between them (see Table 4), showing a Cronbach's alpha below the recommended value (0.60). Same occurs in the scale reliability compound and variance extracted indices (0.61 and 0.36 respectively).

In addition to the results obtained through statistical analysis, semantic analysis of the section 5 items, created several problems in the model, that confirms the findings in the statistical analysis. According to this, we decided to remove those items that did not fit into the model. Therefore, all items of section 5 (S5) were eliminated. These items "ask" for the respondent's believes that their classmates on several aspects of the subject and not the opinion from himself, as in the rest of the questionnaire items. This form of writing, derived from the original questionnaire from Hackman and Oldham (1975), generated confusion among respondents, which altered the scales results.

The social satisfaction scale was eliminated and the items S3P14 and S3P10 (from internal motivation scale) were removed. With these changes, in order to get a more adjusted measurement model, a new structure (respecified mode) (see Figure 2) was created, analyzing the satisfaction measure as second orderfactor (Sat_2ndOrder) composed by the other scales (internal work motivation, growth, satisfaction with grades, satisfaction with security and satisfaction with supervision) measured as multi-item. While social satisfaction scale was eliminated.

The values for the internal work motivation after re-specification present several changes. Because the model is unidentified now, it was estimated using the growth scale. According to the new factor structure, internal work motivation scale showed a good and better fit for the re-specified model, than for the original model. As they were not modified, values for satisfaction with growth, satisfaction with grades, satisfaction with security and satisfaction with supervision scales are the same that those in the original model and are showed in table 6.

Regarding of the reliability test, all scales show a Cronbach alpha above the recommended value (see table 8). The values obtained in the compound reliability and variance extracted from the general satisfaction measured as single-item scale (FC = 0.81; VE = 0.67), and as multi-item scale (see table 9), are very satisfactory and values are higher than those obtained in the initial model.

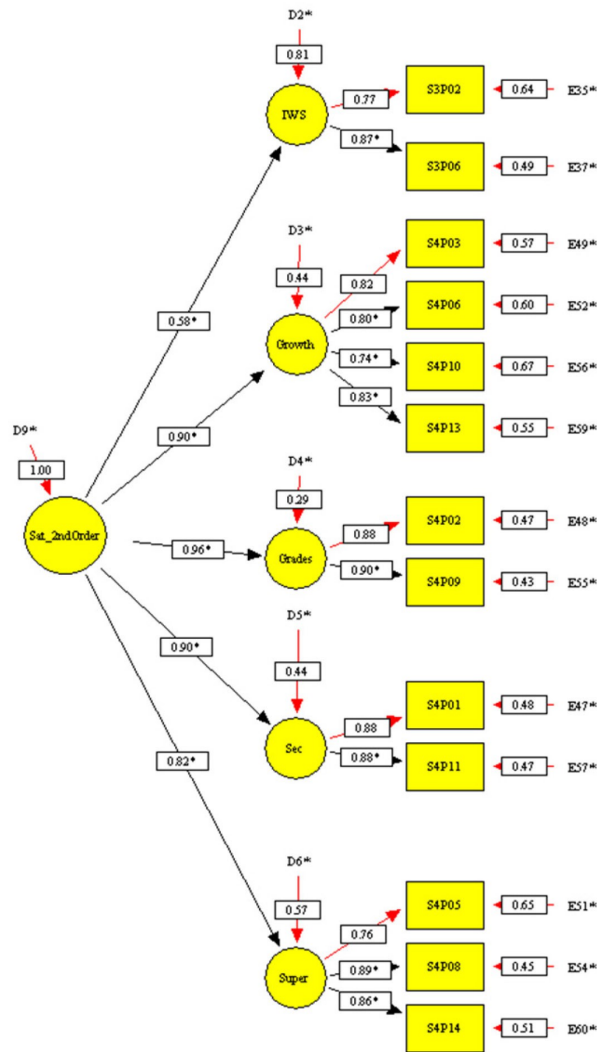


Figure 2. Respecified Model (Sat1 = Satisfaction; IWS = Internal work satisfaction; Grades = Satisfaction with grades; Sec = Satisfaction with security; Super = Satisfaction with supervision)

Scales	No. of items	Chi square	Freedom degrees	NFI	CFI	AGFI	GFI	RMSEA
Internal work satisfaction	2	16.2113	8	0.921	0.957	0.849	0.942	0.088
Growth	4	Scale not modified. Values on table 6.						
Satisfaction with grades	2	Scale not modified. Values on table 6.						
Satisfaction with security	2	Scale not modified. Values on table 6.						
Satisfaction with supervision	3	Scale not modified. Values on table 6.						
Social satisfaction	Scale eliminated in the respecified model due to the low correlations between scale items, and reliability compound and variance extracted values below 0.7 and 0.5, respectively.							

Table 7. Goodness of fit indexes of the respecified model

Scale	Item	Factor loading	Squared Multiple Correlation	Cronbach's Alpha if item deleted	Cronbach Alpha
Internal work satisfaction	S3P02	0.77	0.709		0.830
	S3P06	0.87	0.709		

Table 8. Internal consistency of the respecified model

Scale	Number of items	Compound reliability	Extracted variance
Internal work satisfaction	2	0.81	0.67

Table 9. Scales reliability

Since it is not possible to make a comparison by means of the goodness of fit indices, the comparison of satisfaction as single-item and multi-item scale measures, was made according to the R2 values and the standard error associated with both equations (table 10). Item S3P03 (general satisfaction single-item), explained the greatest variance and presents a smaller standard error. This item successfully represents the general satisfaction as a single-item scale. In the other hand, the satisfaction measured as a second order factor, explain a high proportion of variance, although the internal motivation scale has an R2 below 0.5 (0.34), explaining a very small part of it (see table 10).

Scale	R2
<i>Satisfaction single-item scale</i>	
S3p03	0.96
<i>Satisfaction multi-item scales</i>	
Internal work satisfaction	0.34
Growth	0.81
Satisfaction with grades	0.92
Satisfaction with security	0.81
Satisfaction with supervision	0.67

Table 10. Single and multi-item satisfaction scales R squared

Analyzing the goodness of fit of the satisfaction scale in the re-specified model, as a second order multi-item measure, the values obtained show that despite that they are slightly below the recommended values ($X^2 = 132.01$ in 59 g.l, $p = 0.000$; NFI = 0.84; NNFI = 0.87; CFI = 0.91; IFI = 0.91; GFI = 0.81; AGFI = 0.71; (RMSEA = 0.098), remains a significant model given the large number of parameters to be estimated in the global model versus the number of observations.

Table 11 lists the results of the extracted variance versus squared correlation test (above diagonal) and the correlations confidence interval test (below diagonal). According to these tests, discriminant validity is established among all factors, except among satisfaction with grades and satisfaction with security and satisfaction with growth in the extracted variance versus squared correlation test.

	Internal work satisfaction (F1)	Growth (F2)	Satisfaction with grades (F3)	Satisfaction with security (F4)	Satisfaction with supervision (F5)
F1	0.67	0.57	0.24	0.14	0.25
F2	(0.38-0.95)	0.63	0.68	0.62	0.56
F3	(0.09-0.37)	(0.25-0.74)	0.79	0.82	0.64
F4	(-0.00-0.17)	(0.22-0.68)	(0.28-0.87)	0.77	0.47
F5	(0.11-0.40)	(0.21-0.65)	(0.23-0.75)	(0.13-0.55)	0.70

Table 11. Discriminant validity

6. Conclusions

Instruments used to measure the satisfaction of students are basically focus on assessing aspects related to the quality of the service offered by an institution, the questionnaire JDS can fill a gap in this field (Brennan et al., 2003) making an assessment of satisfaction from a different perspective, where the process of teaching and learning, and students relations with their environment, are its object of analysis and its main objective.

Therefore we propose a new form to assess the students' satisfaction based in the JDS questionnaire. It is important to highlight that JDS has been widely validated in the enterprise world, consequently can be a useful tool for teachers in areas such as human resources and management, allowing them to focus on the process of learning with a more professional view, approaching the student to the professional and working environment. In the same way it allows them to conduct an assessment of the students' perceptions about their class and his role as a teacher.

After statistical analyses and changes made to the initial model based on the problems encountered in a first analysis, the satisfaction model measured by multiple scales present an acceptable fit despite of the fact that the inclusion of several variables generates a quite complex model and as a result, may present some problems like those found in this study.

Even though some of the satisfaction scales presented a good fit, like the internal work satisfaction, growth satisfaction, the satisfaction with supervision and satisfaction with grades, the social satisfaction present poor fit and caution will be needed in the use and the interpretation of them.

Besides, we have been able to validate a single-item measure of satisfaction, simpler, and less costly, according by Nagy (2002). The single-item scale represented by a single item can be a simple but valid alternative to measure the concept of satisfaction.

7. Limitations

This study has used an undergraduates sample, but does not included other populations as a master or PhD students. Besides, the data collected came from just one career degree from a unique university in Spain. Therefore, future studies should use a larger sample including another careers and degrees, in order to amply and generalize the results.

Another limitation of this study is the administration mode of the survey. We used two modes: via a paper questionnaire and via the web. Although Carini, Hayek, Kuh, Kennedy & Oiumet (2003) reported no differences between both modes, further research into possible mode differences is needed.

8. Future research

In future studies, in addition to the above, it would be interesting to analyze the scales that were modified in the present study. An example is the scale of social satisfaction, which did not fit to a global model, and probably should be analyzed as an independent scale in other studies.

Also, since we had operationalized the concept of satisfaction as a reflective model (Diamantopoulos, Riefler & Roth, 2008), we think this could have generated a misspecification of the model, and therefore, further research is needed wherein the model can be tested with a formative form.

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Annex

Definitions of the scales items of the JDS university teaching questionnaire. English and Spanish. Source: (Martínez-Gomez & Marin-Garcia, 2009; Marin-Garcia et al., 2009). In bold items retained in final model.

Scale	Item code	Adapted Definition
General satisfaction	S3P03	Overall, I am very satisfied with this course. En general, estoy muy satisfecho con esta asignatura
Internal work motivation	S3P02	My opinion about myself improves or increases when I do my job in this class. Mi opinión de mi mismo mejora o aumenta cuando hago bien mi trabajo en esta asignatura
	S3P06	I feel a great satisfaction when I do well the class activities. Siento una gran satisfacción cuando hago bien las tareas encomendadas en la asignatura
	S3P10	I feel bad or unsatisfied when I realize I have not done well the class activities. <i>Me siento mal o insatisfecho cuando me doy cuenta de que no he hecho bien las actividades de la asignatura</i>
	S3P14	My feelings are greatly affected by how well I perform the class activities. <i>Mis sentimientos se ven muy afectado por lo bien o mal que desempeñe las tareas de la asignatura</i>
	*S5P01	Most students taking this course feel a great satisfaction when they complete their class activities. <i>La mayoría de los alumnos que cursan esta asignatura sienten una gran satisfacción cuando completan bien las actividades encomendadas</i>
	*S5P09	Most people who attend this course feel bad or unsatisfied when they do not do well their work. <i>La mayoría de las personas que cursan esta asignatura se sienten mal o descontentos cuando no realizan bien su trabajo</i>
Growth	S4P03	The degree of achievement and personal development that I get doing the class activities. El grado de realización y de desarrollo personal que obtengo al realizar las actividades de la asignatura
	S4P06	The sense of growth that I get when I do my work. El sentimiento de autorrealización que obtengo al hacer mi trabajo
	S4P10	The degree of independence of ideas and action I can have. El grado de independencia de ideas y acción que puedo ejercer
	S4P13	The extent to which my activities as a student are stimulant. La medida en que mis actividades como estudiante son estimulantes
Satisfaction with grades	S4P02	The grade I get. La nota que recibo
	S4P09	The extent to which my contribution to the class activities is adequately rewarded with grades. La medida en que mi contribución en las actividades de la asignatura está bien recompensada con notas
Satisfaction with security	S4P01	Degree of security that I pass the course. Grado de seguridad de aprobar la asignatura
	S4P11	The security I feel about the possibility of getting a high note in the course. La seguridad que siento respecto a la posibilidad de sacar nota alta en la asignatura
Social satisfaction	S4P04	The people I talk to and work in the class. <i>La gente con la que hablo y trabajo en la asignatura</i>
	S4P07	The opportunity to meet other people while doing activities. <i>La oportunidad de conocer otras personas mientras realizo las actividades</i>
	S4P12	The opportunity to help other students while doing my activities. <i>La posibilidad de ayudar a otros compañeros mientras hago mis actividades</i>

Scale	Item code	Adapted Definition
Satisfaction with supervision	S4P05	The degree of respect and fair treatment I receive from my teacher. <i>El grado de respeto y el trato justo que recibo de mi profesor</i>
	S4P08	The degree of guidance or support I get from my teacher. <i>El grado de orientación o de apoyo que recibo de mi profesor</i>
	S4P14	The overall quality of the supervision I receive from my work. <i>La calidad global de la supervisión que recibo de mi trabajo</i>
Items included in JDS but not included in the original version of the adapted JDS to Student's satisfaction	S3P09	I rarely think about not to attend class. <i>Pocas veces pienso en dejar de asistir a clase</i>
	S3P13	Overall, I am satisfied with the kind of activities I do in this course. <i>En general, estoy satisfecho con el tipo de actividades que realizo en esta asignatura</i>
	*S5P02	Most of the people who attend this course are very satisfied with their work. <i>La mayoría de las personas que cursan esta asignatura están muy satisfechas con su trabajo</i>
	*S5P08	People who attend this class rarely think about not to attend school <i>Las personas que cursan esta asignatura pocas veces piensan en dejar de asistir a clase</i>

*Section five (S5) statement. Now think about your CLASSMATES. Answer in terms of how you think they feel. *Ahora piensa en tus COMPAÑEROS DE CLASE. Responde en función de cómo crees que ellos/as se sienten.*

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