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# Sustainable career development for R&D professionals: Applying a career development system in Basque country

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ABSTRACT

The goal of this study is to measure the effectiveness of a career development system implemented at a research and technology organization at satisfying the context requirements of a decree issued by the Basque Country government. Through in-depth surveying of 80 R&D professionals over the five years, the authors aimed to determine whether a career development system, when it is linked to context requirements and researchers' contributions, could offer researchers feedback about their career aims and increase their job satisfaction. During the five years of the study, the researchers' capacity to meet career requirements improved by 20%, and job satisfaction, although it declined at first, increased substantially in the last two years, reaching a historic high for the employee satisfaction survey.



## 1. Introduction

There is a long tradition of analysis of the relationship between job satisfaction and job performance but in the field of organizational psychology, the topic is currently receiving much interest. Current studies are usually conducted from the perspective of workplace attitudes and productivity (Judge, Thoresen, Bono, & Patton, 2001) or researchers' willingness factors to engage in R&D activities (Abdulla, Djebarni, & Mellahi, 2011; Olaya et al., 2017).

Research and technology organizations (RTO), the major focus of this study, are centres of knowledge generation and dissemination that provide policies, methods, and resources for R&D activities. Most RTOs in Spain are located in the Basque Country. More than 3000 researchers are RTOs' employees in Basque Country. In consequence, the management of their professional career is critical and it affects their job satisfaction and performance.

Although the literature contains several qualitative and quantitative studies and models, these need to be tested in new organizations in order to validate the models. This validation would contribute significantly to the literature and assist practitioners. In consequence, this study contributes to the literature providing an implemented and verified career development system that accounts for the concerns of context requirements (results) and researchers (satisfaction) and responding to employee incentives and long-term plans (career development).

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Basque Country has recently undergone an important technology transformation, and its innovation system is now focused on new technologies and on trying to make a place for itself among the most advanced economies; its new approach is based on knowledge management, interaction, and transfer within Basque society and with other European regions (Basque Government, 2014). Decree 109 was enacted in 2015 to regulate the Basque Science, Technology, and Innovation Network, and this decree reorganized the network, defining the position of each RTO in terms of its research specialization, achievements, status within the R&D value chain, and the results it could be expected to produce. Consequently, each RTO had to align its corporate strategy with the government's guidelines and expectations, the crucial element of which was employee career development (Decree 109/2015 June 23, 2015).

More specifically, in this Decree, RTO key performance indicators and professional career goals were redefined to improve RTO efficiency. One of the mandatory programs for the Decrees' 2020 milestone is Professional Careers (Decree 109/2015 Annex II), which defined key requirements for a variety of research and directorial/management positions within RTOs (Tables 1 and 2).

The cornerstone of these RTOs is employees as they have the vital knowledge for the R&D which is a key strategic value for these organizations (Bremser & Barsky, 2004). Currently, managers and employers understand they cannot inspire good performances from their employees in an environment where both personal career management and organizational career management practices are absent. The development of new methods is necessary, which calls for a fundamental change of approach in this domain (Kaya & Ceylan, 2014).

Consequently, the primary challenge for this study was to develop an adequate and reliable career development system for the key performance indicators (determined by the requirements in Tables 1 and 2) that maintains or improves employee job satisfaction. Researchers' acceptance was needed since an RTO's performance depends on the performance of its researchers as well as their knowledge and motivation. Therefore, investments in human resources development and high-commitment strategies that influence employee commitment and motivation are necessary (Lee & Bruvold, 2003).

According to this motivation, this study makes the following research questions:

Research question 1: Does a new culture of organizational management based on a professional career development system within a holistic framework improve compliance with the Decree requirements?

Research question 2: Do human resources practices affect the job satisfaction of the R&D personnel?

This paper is divided into six sections. In the first two sections, a theory of career development and employee job satisfaction is developed, and hypotheses are presented. This theory and these hypotheses allow for the identification of variables that support the paper's analysis and implemented framework. Then, sections three through six present the study's methodology, findings, discussion, and conclusions.

**Table 1**
Requirements for direction/management careers: Decree 109/2015.

| Levels | Description | Requirements | Associated positions |
|---|---|---|---|
| 1 | • Leads, plans and manages the global strategies and objectives of the Centre.<br>• Provides a global vision of the organization. | • Doctorate degree.<br>• Proven experience in the management of centres and large teams for 10 years.<br>• Mastery of spoken and written English. | • Director-General<br>• Scientific-Technological Director |
| 2A | • Directs, plans and manages the strategy and objectives of a research area of the Centre, which may include several technological lines.<br>• Ensures and contributes to the Centre's scientific and technological excellence.<br>• Promotes and seeks new opportunities for growth and opening to new sectors and activities.<br>• Participates in the governing bodies of the Centre. | • Doctorate degree.<br>• High command of the variables of the market sector and proven track record for 5 years.<br>• Mastery of spoken and written English. | • Area Director |
| 2B | • Directs, plans and manages the strategy and objectives of a functional support area of the Centre.<br>• Ensures and promotes excellence in management.<br>• Participates in the governing bodies of the Centre. | • Master's degree or equivalent<br>• Participates in the governing bodies of the Centre<br>• Mastery of the variables of the market sector and proven track for five years in the process that leads.<br>• Mastery of spoken and written English. | • Management<br>• International Relations Director<br>• Institutional Relations Director<br>• Staff Area Director |
| 3 | • Leads a stable research staff or professionals while coordinating a portfolio of projects or services for the development of a research line, knowledge area or technological service.<br>• Prepares, proposes and executes the objectives and plans for the management of the line or unit in their sphere of responsibility | • Doctorate degree<br>• Proven track record in leadership of research teams for 5 years.<br>• Mastery of spoken and written English | • Head of Technology Lines |
| 4 | • Transfers the vision to the operational management of the activities, people and economic and material resources of their unit/area.<br>• Administration and/or technical support staff is included here. | • University or college degree<br>• Proven trajectory in activities in the process for 2 years.<br>• Mastery of spoken and written English. | • Staff Area |

**Table 2**
Requirements for researchers: Decree 109/2015.

| Levels | Description | Requirements |
|---|---|---|
| Main Researcher (G1) | • Acts as a reference, drives, leads, and manages the process of recruitment and development of proposals, detecting and interpreting customer needs and developing technical offers.<br>• Searches, establishes and maintains a network of organizations or allied entities, employees and contracts: centres, universities, companies … | • Doctorate degree.<br>• Professional experience: more than 10 years in research.<br>• 10 indexed publications, articles and papers in the scientific environment and doctoral thesis supervision.<br>• Languages: mastery of spoken and written English.<br>• Projects: leadership of 2 international consortium projects with teams from more than 2 countries as well as management of autonomous parts (tasks, packages or subprojects) of 5 projects in national/international consortia<br>• Participation in at least 1 patent; participation in the development of transferable technologies through international patents and license agreements will be valued. |
| Senior Researcher (G2) | • Participates in the process of attracting and preparing offers, detecting and interpreting customer needs and preparing technical offers.<br>• Searches, establishes and maintains a network of organizations or allied entities, collaborators and contacts: centres, universities, companies … | • Doctorate degree.<br>• Professional experience: more than 4–5 years in research.<br>• 6 indexed publications.<br>• Languages: Mastery of spoken and written English (at the level of work in international teams and writing)<br>• Projects: management of autonomous parts (tasks, packages, subprojects) of 3 projects in national or international consortia and 5 projects/direct contracts with companies.<br>• The participation in patents and in the development of transferable technologies will be valued |
| Junior Researcher (G3-G4) | • Prepares offers of projects of low and occasionally medium complexity<br>• Relates to and contacts the network of organizations or allied entities, collaborators and contracts: centres, universities, companies … | • Doctorate degree, bachelor's degree or engineering.<br>• G3: minimum of 2 indexed publications<br>• Languages: Intermediate spoken and written English.<br>• Knowledge of other languages will be valued |

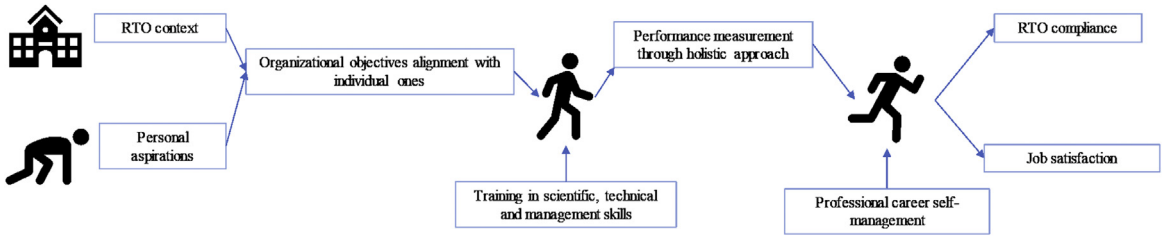


**Fig. 1.** Implemented framework.

## 2. Theory and hypotheses

Fig. 1 illustrates the implemented framework (big-picture conceptual model). As seen in the figure, at the beginning of a labor relationship, researchers have their own aspirations, and the RTO has its own objectives. The first unifying key for this relationship is the alignment of the RTO's objectives and key performance indicators with those of the individual so that the RTO's indicators and goals downscale to become the researchers. Researchers require training to comprehend the philosophy underlying this model and to make them aware of their own goals and the trajectory of their careers in the context of a particular RTO. Therefore, the methodology is integrated into a holistic framework, in which all human management processes are related within the people capability maturity model. With this framework in place, researchers contribute to fulfilling the RTO's objectives, and since they are responsible for their professional careers, they feel satisfied at work. As a result, on the one hand, RTO objectives are linked to context requirements, and on the other hand, researchers are satisfied with their research lines, projects, and the challenges they face. Researchers can monitor their professional career requirements using the application of informatics. Subsequently, they can visualize in real-time the requirements they have achieved and which ones they need to promote to the next category.

According to the study's conceptual framework, two key aspects will be reviewed: career development and employee job satisfaction. These two aspects guided the selection of an adequate organizational approach (new career development) that focuses on the satisfaction of the main protagonist (researchers).

### *2.1. R&D professional career development*

The development of human resources is associated with organizational success. It is crucial to integrate employees into an organization and contemporaneously facilitate organizational dynamics, such as motivation, organizational commitment, and employee job satisfaction (Hobfoll, Halbesleben, Neveu, & Westman, 2018; Spurk, Hirschi, & Dries, 2018). Research on vocational psychology has confirmed that an individual progress along different lines at different stages of their careers and that at any given stage, these individuals have unique career concerns, developmental tasks, personal challenges, and psychological needs (Litano & Major, 2016). The greater the match or similarity between an individual's career goals and plans and the organization's plans for the employee, the more positive the outcomes of motivation and the greater the level of job satisfaction for the employee (Granrose, 1997).

A career development system is a key component of the activities of both individuals and organizations (Kaya & Ceylan, 2014), and these programs are usually explored as an isolated activity in organizations. In addition, career development has been primarily concerned with accumulating job competencies and gaining experience in a specific job (Akkermans, Brenninkmeijer, Huibers, & Blonk, 2013). In recent decades, however, more dynamic careers have become more common, with employees developing through horizontal shifts between multiple organizations (Arnold & Cohen, 2008). To obtain and retain a job in this changing labor market, individuals increasingly require career competencies to help them manage their careers (Van Der Heijde and Van Der Heijden, 2006).

Career development entails many different concerns, such as developing abilities, preserving current skills, and preparing for the future after promotion (Kaya & Ceylan, 2014). Companies invest in career development programs for several reasons: to enhance employee performance, increase managerial performance, teach corporate culture to salespeople, strengthen principal values, help salespeople with career improvement, and offer extra benefits to employees (Ko, 2012). Employees, especially young people, want to develop and be in control of their careers, and career development programs enable all workers to advance in an organization from the start of their careers. Such programs also help determine career paths and remove obstacles to career progress. Furthermore, such programs accelerate workflow in the organization by providing training for personnel whose career paths have been more stable and who are now experiencing increased mobility.

Some of the organizational career development practices addressed in the literature are job enrichment, career progression ladders, employee workshops, and job rotation. Some organizations recognize high-performing employees and provide them with a promising environment to take risks and achieve improved career resilience. The people capability maturity model (Fig. 2) is a roadmap for implementing practices that continuously improve the capability of an organization's workforce.

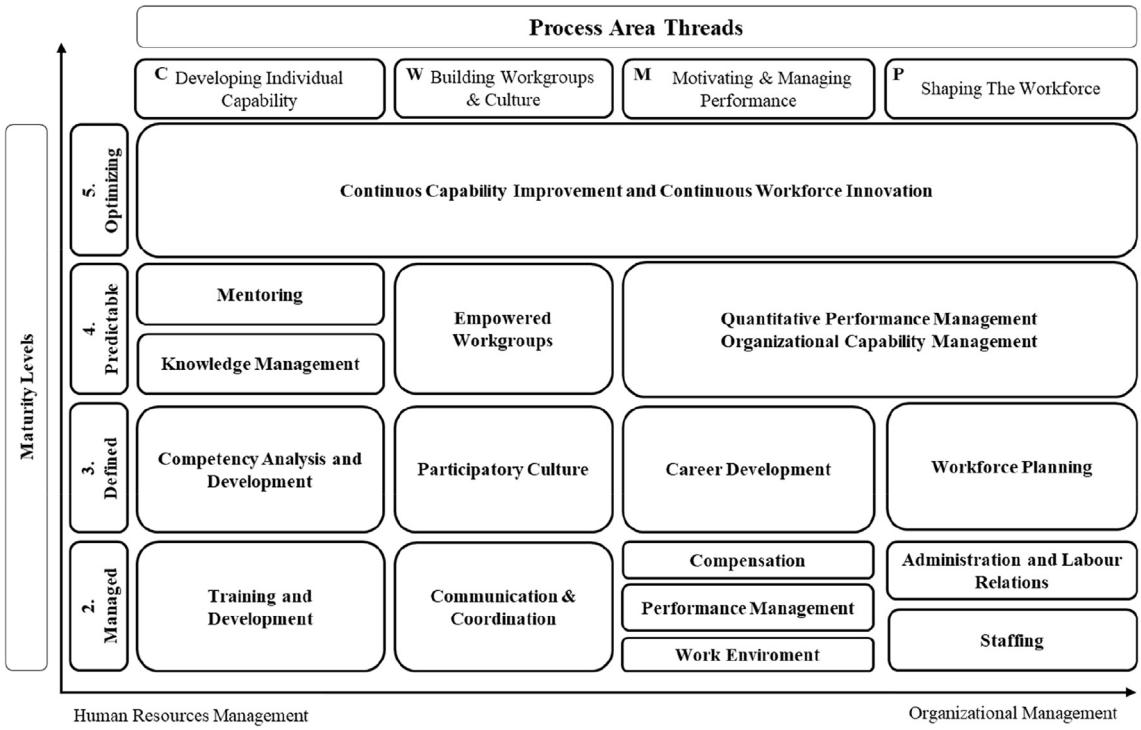


**Fig. 2.** People capability maturity model.

The above roadmap was published by Carnegie Melon University in 1995 (Curtis, Hefley, & Miller, 2002) as a foundation for a model of best practices for managing and developing an organization's workforce. Its primary objective is to improve the capability of the workforce. This study is focused on the design and implementation of career development processes, but this cannot be adequately introduced in the organization if it is not connected and coherently conducted with the rest of the processes such as training, performance measurement, or competency analysis and compensation. While the organization implements the career development system in parallel, the other processes need to be elaborated upon. The people capability maturity model offers the required guidelines to achieve this coherence among the processes, and in this study the focus is the career development process.

### *2.2. Employees' job satisfaction*

General job satisfaction, the overall attitude of liking or disliking a job, is a universal and essential part of career development. One of the assumptions that employees have about their careers is that there ought to be a match between their aspirations and the organization's career system (Malhotra, Smets, & Morris, 2016). Some organizations may not seek to make such a match, and dissatisfaction and withdrawal may result (Cartwright, 2005).

This topic has been studied in different locations using a variety of perspectives, including motivation (Olaya Escobar et al., 2017), job performance (Judge et al., 2001), job impact (Taylor, 2014), demographic and environmental factors (Abdulla et al., 2011), and private or public administrations (Demircioglu, 2018).

There are nine facets to job satisfaction: pay, promotion, benefits, contingent rewards, operating procedures, supervision, coworkers, the nature of the work, and communication (Lumley, Coetzee, Tladinyane, & Ferreira, 2011). Job satisfaction represents employees' feelings towards their jobs, and thus, job satisfaction is a function of the perceived relationship between employees' anticipations in relation to the job and what they gain from that job, as well as the meaning or value that employees attribute to their jobs (Ko, 2012).

**Table 3**
Population and sampling.

| | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| Participants | 55 | 58 | 58 | 65 | 63 |
| Population | 76 | 76 | 76 | 74 | 85 |
| Participation Percentage | 72% | 76% | 76% | 88% | 74% |

**Table 4**
Survey variables and survey items.

| Variables | According to | Variable |
|---|---|---|
| Satisfaction with my research lines | Motivation (Şimşek et al., 2011) | Dependent |
| Satisfaction with my projects | | Dependent |
| Satisfaction with my challenges | | Dependent |
| Relationships within organization | Relationships with coworkers (Blustein, Kenna, Gill, & DeVoy, 2008; Grant, 2007; Duffy et al., 2015; Lumley et al., 2011) | Independent |
| Express opinions | Communication (Lumley et al., 2011) | Independent |
| Motivation | Maslow Motivation Theory (Maslow, 1943) | Independent |
| Recognition of carried out work | Intrinsic reward (Blustein et al., 2008; Grant, 2007; Duffy et al., 2015) | Independent |
| Contribution to my training | Individual needs and what the organization is providing (Cable & DeRue, 2002) | Independent |
| Commitment of resources | | Independent |
| Performance measurement system | Nature of work and communication (Lumley et al., 2011) | Independent |
| Information on my objectives and tasks | | Independent |
| Information on correct development of my work | | Independent |
| Knowledge of the department's roadmap | | Independent |
| Projects' management | Operating procedures (Lumley et al., 2011) | Independent |

**Table 5**
Research study reliability and validity.

| Year | Scale reliability statistics | | | Measure of sampling adequacy |
|---|---|---|---|---|
| | Mean | SD | Cronbach's α | KMO (Overall) |
| 2014 | 2.99 | 0.466 | 0.895 | 0.769 |
| 2015 | 2.92 | 0.458 | 0.890 | 0.810 |
| 2016 | 2.88 | 0.479 | 0.887 | 0.810 |
| 2017 | 3.10 | 0.437 | 0.868 | 0.764 |
| 2018 | 3.11 | 0.434 | 0.842 | 0.745 |

Cable and DeRue (2002) reviewed the varying ways that subjective fit has been operationalized and measured and concluded that three components were integral to the overall assessment of fit: person-organization fit (P–O fit), needs-supplies fit (N–S fit), and demands-abilities fit (D-A fit). P–O fit refers to an overlap of personal and organizational values; N–S fit refers to what an individual needs and what the organization provides; and the D-A fit refers to how well a person's skills and abilities match the needs of the work environment. Cable and DeRue observed that each of these components is a unique factor in the overall assessment of subjective fit. A number of other later studies have used this framework to conceptualize and assess subjective fit (Rehfuss, Gambrell, & Meyer, 2012; Duffy, Autin, & Bott, 2015).

Job satisfaction is also linked to motivation. According to Maslow, motivation means "behaving with one's own desire and eagerness and making efforts for the purpose of achieving a specific goal" (Maslow, 1943). Motivation is defined as the process by which an employee's efforts are strengthened for, oriented to, and sustained toward attaining a goal (Robbins & Coulter, 2009; Kaya & Ceylan, 2014). This definition of motivation has three elements: energy, direction, and persistence. The common

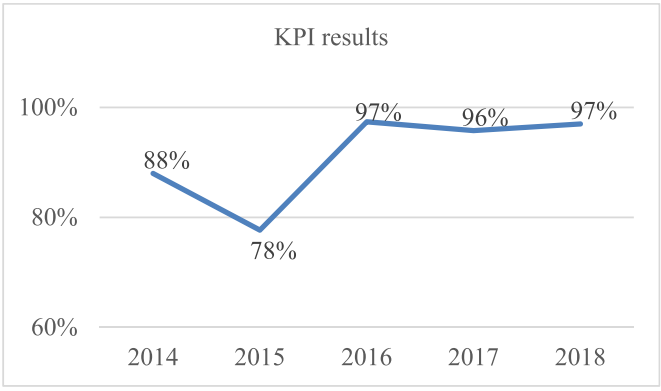


**Fig. 3.** RTO annual key performance indicators' results (2014–2018).

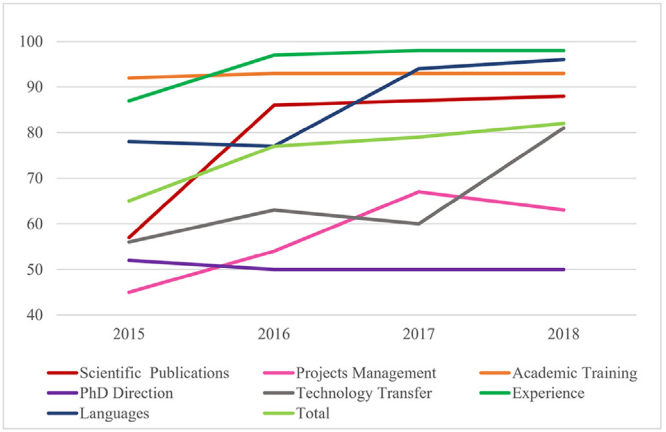


**Fig. 4.** Decree compliance (2015–2018).

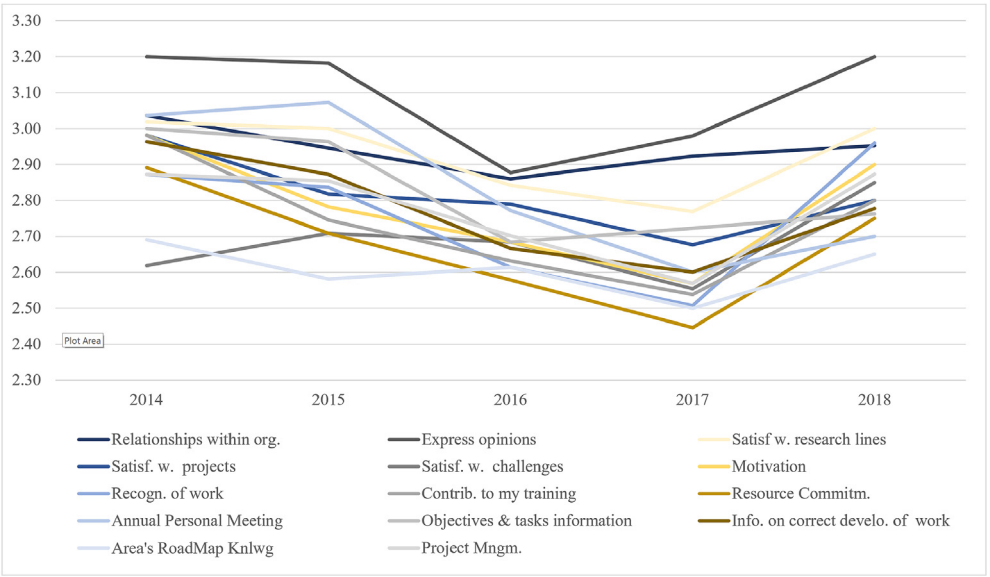


**Fig. 5.** Mean evolution (2014–2018).

**Table 6**
Multivariate test results.

| | | Relationships within org. | | | Express opinions | | | Motivation | | | Recognition of work | | | Contribution to my training | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Year | Stats | Satisf w. research lines | Satisf. w. projects | Satisf. w. challenges | Satisf w. research lines | Satisf. w. projects | Satisf. w. challenges | Satisf w. research lines | Satisf. w. projects | Satisf. w. challenges | Satisf w. research lines | Satisf. w. projects | Satisf. w. challenges | Satisf w. research lines | Satisf. w. projects | Satisf. w. challenges |
| 2014 | F | 1.46 | 0.14 | 7.10 | 9.81 | 2.03 | 0.75 | 17.4 | 19.10 | 30.9 | 0.54 | 0.96 | 5.62 | 9.00 | 4.71 | 2.13 |
| | p | 0.23 | 0.72 | 0.01 | 0.00 | 0.16 | 0.39 | <.001 | <.001 | <.001 | 0.47 | 0.33 | 0.02 | 0.00 | 0.04 | 0.15 |
| 2015 | F | 2.5 E−29 | 0.38 | 1.55 | 18.24 | 6.10 | 5.39 | 33.47 | 24.03 | 41 | 4.93 | 5.27 | 5.15 | 4.87 | 2.39 | 6.28 |
| | p | 1.00 | 0.54 | 0.22 | <.001 | 0.02 | 0.03 | <.001 | <.001 | <.001 | 0.03 | 0.03 | 0.03 | 0.03 | 0.13 | 0.02 |
| 2016 | F | 4.92 | 6.15 | 10.47 | 0.04 | 0.02 | 0.02 | 30.82 | 24.80 | 57.7 | 0.60 | 0.01 | 0.08 | 5.21 | 0.90 | 2.20 |
| | p | 0.03 | 0.02 | 0.00 | 0.85 | 0.89 | 0.90 | <.001 | <.001 | <.001 | 0.44 | 0.92 | 0.78 | 0.03 | 0.35 | 0.15 |
| 2017 | F | 1.50 | 4.80 | 0.55 | 6.14 | 9.96 | 25.85 | 19.03 | 19.91 | 36.63 | 0.02 | 1.99 | 0.04 | 0.01 | 0.02 | 3.45 |
| | p | 0.23 | 0.03 | 0.46 | 0.02 | 0.00 | <.001 | <.001 | <.001 | <.001 | 0.90 | 0.17 | 0.84 | 0.92 | 0.90 | 0.07 |
| 2018 | F | 2.13 | 9.9E-04 | 1.87 | 17.49 | 34.71 | 15.86 | 1.25 | 7.04 | 7.67 | 2.00 | 0.02 | 27.32 | 0.00 | 0.32 | 2.62 |
| | p | 0.15 | 0.98 | 0.18 | <.001 | <.001 | <.001 | 0.269 | 0.01 | 0.008 | 0.16 | 0.89 | <.001 | 0.95 | 0.58 | 0.11 |

element of the definitions of motivation in the literature is that it affects human behavior, and as a result of this effect, guides the person toward certain actions (Şimşek, Akgemci, & Çelik, 2011). This study defines the concept of motivation as perception that one's personal preferences (values, needs, and skills) match what is being provided by the work environment.

Based on the two research questions cited in the introduction and on the above literature review, this study involves the following hypotheses:

**Hypothesis 1**. A new culture of organizational management based on a professional career development system within a holistic framework improve compliance with the Decree requirements.

**Hypothesis 2**. Human resources practices affect the job satisfaction of R&D personnel.

## 3. Method

### 3.1. Sample and data collection procedures

For the case study, a research population of RTO researchers was selected, and a survey was administered. A survey application was created online, prepared on the website, finalized, and sent to the participants via e-mail, and participation was anonymous and voluntary. Population was 76 researchers from 2014 to 2016, 74 in 2017 and 85 in 2018 (see Table 3).

Table 3 illustrates the number of participants out of the total population and the percentage of participation. The survey population excluded non-research staff (covered by a different survey outside the scope of Decree 109/2015) and directors (as they could positively influence the results). The participation of the research staff was, on average, 71% with the highest percentage in 2017 and the lowest in 2014. The sample for each year is representative of the population. In turn, half of the staff completing the survey recorded comments regarding improvements in human resources management.

Forty percent of the population were Ph.D. candidates, and the remainder were engineers; 35% were female, and the average age of the population was 33. The researchers are specialized in different fields, and all conducted research into software applications (information and communication technologies) in different sectors.

The organization's annual satisfaction questionnaire consists of 40 questions, covering seven areas of RTO operation. For this research project, 14 questions were selected from six different areas, covering a period from 2014 to 2018 (five years), and the questions were selected from previous studies on job satisfaction.

For all the survey items, a 4-point Likert scale was used, answers ranging from "strongly disagree" to "strongly agree." The data were collected from the administration department of the RTO and analyzed globally (by management) and by each department (results were delivered to each area director). This variable of job satisfaction is calculated using three different subscales: satisfaction with research lines, satisfaction with projects, and satisfaction with challenges faced.

### 3.2. Variables and empirical strategies

Based on the concepts described in the literature review, variables and items were selected from the annual satisfaction survey (Table 4). Table 4 also demonstrates the relationship between the area of inquiry and theory (the variables selected appear in the literature as influencing job satisfaction, as explained in the theory section). The questions were repeated in all the annual surveys. These items were chosen because they were most relevant to the conceptual framework on which the present study is based.

### 3.3. Research study reliability and validity

Using the data obtained from the surveys, reliability was assessed, and the validity was verified. To examine the relationship between items, an analysis of the items was performed (Table 5). Measurements were evaluated using Cronbach's

| Resource Commitment | | | Annual Personal Meeting | | | Objectives & tasks information | | | Info. on correct develo. of work | | | Area's RoadMap Knowledge | | | Project Management | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Satisf w. research lines | Satisf. w. projects | Satisf. w. challenges | Satisf w. research lines | Satisf. w. projects | Satisf. w. challenges | Satisf w. research lines | Satisf. w. projects | Satisf. w. challenges | Satisf w. research lines | Satisf. w. projects | Satisf. w. challenges | Satisf w. research lines | Satisf. w. projects | Satisf. w. challenges | Satisf w. research lines | Satisf. w. projects | Satisf. w. challenges |
| 1.19 | 3.69 | 0.14 | 0.29 | 14.16 | 0.79 | 0.15 | 2.03 | 1.15 | 1.00 | 1.53 | 0.27 | 0.78 | 4.57 | 2.90 | 0.12 | 1.18 | 1.87 |
| 0.28 | 0.06 | 0.71 | 0.59 | <.001 | 0.38 | 0.70 | 0.16 | 0.29 | 0.32 | 0.22 | 0.60 | 0.38 | 0.04 | 0.10 | 0.73 | 0.28 | 0.18 |
| 1.15 | 0.08 | 0.05 | 2.1E-04 | 0.56 | 0.00 | 6.97 | 8.21 | 2.54 | 9.2E-05 | 0.38 | 1.70 | 0.02 | 1.00 | 4.71 | 0.00 | 0.29 | 2.27 |
| 0.29 | 0.78 | 0.82 | 0.99 | 0.46 | 0.95 | 0.01 | 0.00 | 0.12 | 0.99 | 0.54 | 0.20 | 0.88 | 0.32 | 0.04 | 0.94 | 0.60 | 0.14 |
| 0.00 | 0.07 | 0.16 | 0.12 | 0.91 | 0.19 | 0.62 | 0.66 | 0.07 | 6.5E-04 | 0.54 | 0.08 | 4.66 | 0.18 | 1.57 | 0.50 | 0.01 | 6.33 |
| 0.97 | 0.79 | 0.69 | 0.73 | 0.34 | 0.67 | 0.44 | 0.42 | 0.79 | 0.98 | 0.47 | 0.77 | 0.04 | 0.68 | 0.22 | 0.49 | 0.92 | 0.02 |
| 3.81 | 2.00 | 4.07 | 0.78 | 2.76 | 0.23 | 3.2E-07 | 0.31 | 0.32 | 0.80 | 0.24 | 0.07 | 0.40 | 2.36 | 2.25 | 5.39 | 9.77 | 8.24 |
| 0.06 | 0.16 | 0.05 | 0.38 | 0.10 | 0.63 | 1.00 | 0.58 | 0.58 | 0.38 | 0.62 | 0.79 | 0.53 | 0.13 | 0.14 | 0.02 | 0.00 | 0.00 |
| 10.85 | 0.53 | 3.59 | 0.04 | 0.02 | 0.11 | 0.48 | 5.9E-04 | 5.08 | 0.22 | 0.75 | 3.03 | 1.13 | 6.56 | 0.97 | 0.09 | 25.76 | 30.96 |
| 0.00 | 0.47 | 0.06 | 0.85 | 0.88 | 0.74 | 0.49 | 0.98 | 0.03 | 0.65 | 0.39 | 0.09 | 0.29 | 0.01 | 0.33 | 0.77 | <.001 | <.001 |

alpha, and their reliability was tested. A review of all the alpha values demonstrated that all variables are higher than the threshold of 0.7 accepted in the literature, even without the extraction of the average variance (the lowest being 0.84). The research scale consisted of a total of 14 questions; 11 independent and 3 dependents. The Kaiser-Meyer-Olkin value, the most accurate measure of the validity of a scale, was determined to be at least 0.76, which is a good indicator of validity.

### 3.4. Multivariate test

A MANOVA analysis was performed to test the second hypothesis. This analysis illustrates the results of the multivariate test with Pillai's trace analysis (suitable for this study as the population was not large). Univariate tests with all independent and dependent variables for the five years of the study are also shown in section 4.2.

## 4. Findings and validated decisions

During these five years (2014–2018), the implementation of the career development system improved the achievement of key performance indicators for the RTO. Fig. 3 presents the progress of the key performance indicators in terms of the percentage of achievement. These figures were obtained by the RTO and audited by the Basque government. A transition period is apparent between 2014 and 2016, with positive progress after that, which stabilized in the last three years.

These results were analyzed for their percentage of Decree compliance in terms of professional development and job satisfaction. The discussion below demonstrates that both hypotheses were confirmed.

### 4.1. Hypothesis 1

The first hypotheses predicted that a new culture of organizational management based on a professional career development system, if implemented within a holistic framework would improve compliance with the Decree requirements.

As Fig. 4 illustrates, the percentage of the RTO's compliance with the requirements of Decree 109/2015 changes from 64% to 82% of the total number of researchers. The variable that improved the most during the four years is the number of scientific publications, which began at 58% achievement and ended at 91%. Measures introduced by the RTO to support the co-authorship of the publication of R&D projects, as well as increased resources for publication in indexed journals helped the most to achieve this result. Requirements that were difficult to achieve were doctoral theses and project management metrics (the variable that did not improve). In this case, training and rotation in the delegation of project management among the researchers were some of the measures taken. In general, it was possible to implement the requirements of the Decree and nearly 20% improvement was achieved. Although the number of R&D personnel at the RTO also increased by 20% (and thus the number of people affected by the Decree), implementation efforts were increased to compensate for this increase. One such adjustment was the implementation of new recruitment policies, which assured that new recruits would comply with and fulfill all the requirements of the Decree. This was a challenge for recruiters, who had to change their mindset, and for the recruits because some candidates were unsuccessful. Therefore, incorporating the people capability maturity model (holistic framework) into the professional career system resulted in an improvement in compliance with the requirements of the Decree, confirming Hypothesis 1.

### 4.2. Hypothesis 2

The second hypothesis predicted that human resources practices would affect the job satisfaction of R&D personnel. An examination of the global mean variation of this study demonstrates that global job satisfaction declined in 2015, increased moderately in 2016, and increased substantially in 2017 and 2018 when the final mean reached a record high for the satisfaction survey (Fig. 5).

The primary results of this study are as follows. Expressed opinions and motivation variables are statistically significant for every year, and motivation affects job satisfaction every year. Therefore, if the RTO can influence researchers' motivation, their satisfaction will improve. The expression of opinions within the organization had a positive effect on researchers' job satisfaction in 2015–2017 and 2018.

The contribution of training was significant in 2014 and 2015 and at the threshold of significance in 2016, with positive dependence in these periods. In 2017 and 2018, its influence diminished. In 2016, the RTO increased its annual training investment by more than 20%, and the researchers currently receive more training. The observed pattern can be explained by training being taken for granted instead of being a motivator.

In contrast, project management emerged as a significant variable affecting job satisfaction in 2017 and 2018. This phenomenon can be linked to recent recognitions of the RTO's. Additionally, according to researchers who have transferred into the industry, companies value researchers with management knowledge, as researchers can also include this knowledge in their CVs and increase their employability in the management of an internationally recognized centre. Another notable result is how annual feedback meetings were linked to project satisfaction in 2014, while the relationship was unobserved or was insignificant after that. These results can be visualized in Table 6.

## 5. Discussion

Every new human resources initiative has its effect on employees. Generally, changes are not welcome, but they are much less welcome if they occur in crucial fields such as career or performance evaluation. In this paper, the authors have contributed to the literature through the practical implementation of a strategy in the circumstances of an apparent contradiction: increasing employee job satisfaction in a scenario in which external requirements are demanding. This study is contiguous with the work of previous studies of employee job satisfaction (Abdulla et al., 2011; Judge et al., 2001) and career development (Kaya & Ceylan, 2014) in a particular organization. It also provides guidelines and requirements so that this system may be implemented by other organizations.

This system was developed based on a holistic framework that is derived in part from previous studies (Loyarte et al., 2018, 2020). These other studies also verified the kinds of changes the RTO underwent in the process of implementation as the organization reached a new balance, making it better prepared for the future. By implementing a professional development system, the researchers were more cognizant of both their career development goals and what they had already accomplished to that point. The implementation of the system was a responsibility shared with the researchers, giving them the freedom to manage their own careers through personalized monitoring that could be consulted in real-time.

The authors have also identified some limitations of the study. The primary limitation is that responding to the surveys was voluntary. This meant that the set of researchers who responded to the survey might have varied. The study also includes the input of different researchers because researcher turnover is high. As the project was primarily driven by Decree 109/2015, the RTO was not able to perform a study of the researchers' aspirations but had to follow the requirements of the Decree itself. Nonetheless, the Decree requirements must be considered at this point, as the government has performed a benchmarking of research careers in Europe and reviewed the centres as well as the professional career framework previously implemented by several centres in the Basque network.

Most similar career development and job satisfaction studies have been mentioned, but they have not been explained or compared in this study. In the literature review, career development programs and job satisfaction were explained as a cornerstone of this study although other different studies also exist.

According to practitioners, another limitation in the replicability is the implementation itself. In this case, five years of work is necessary, alongside the included management and consultancy. This is a major project that requires significant leadership, and subsequently, while the design and requirements are easy to replicate, the implementation requires time and effort.

## 6. Conclusions

Researchers are the cornerstone of the RTO. Their motivation, co-responsibility for their professional careers, and contributions to the centre's objectives are crucial. The five-year implementation results recommend a career development system, as it improved the RTO's production in a way that also allowed for an increase in researcher satisfaction.

The assumptions that motivated this research are related to how professional development might improve compliance with context requirements for RTOs and affect researchers' job satisfaction. The authors have focused on researchers at an RTO and investigated the progress of researcher satisfaction after career development changes as a result of new institutional requirements.

This study may be helpful to managers and scholars as a consolidated practice capable of guiding the implementation of an appropriate career development system as it elaborates on a practical framework with the following features. Each researcher's background, as well as an organization's requirements, forms part of the roadmap for the career development of RTO personnel. The framework links organizational objectives and researcher satisfaction to respond to employees' long-term plans (career development). The framework considers the context requirements of corporate strategies and researchers' contributions to assure their motivation and commitment to an RTO. Consequently, the five-year study demonstrates how key performance indicators properly balance the outcomes of decree compliance and researchers' job satisfaction. This study also helps to ensure that all employees are aware of areas of individual performance that could better contribute to the RTO's objectives.

## Declaration of competing interest

The authors declare no conflicts of interest.

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