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Virtues and shortcomings of guidance and tutoring in higher education: a longitudinal study of the TIMONEL Project

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This research is established within the framework of Project TIMONEL, developing in three phases under a concurrent mixed research model. The ultimate goal was to create a Web Recommendation System (RS) to complete the tutorial and guidance work of university professors. Both qualitative and quantitative data are collected from a large sample of students and professors from different European universities on the needs and situation of guidance practice (phase 1). In addition, certain cases are investigated and the reasons, knowledge, feelings and good practices in guidance and tutoring are explored, in order to identify opportunities for improvement and elements that enable the design of the RS (phase 2). The data collected in the first and second phases of project development were used to finally build a SR capable of receiving feedback from user contributions (phase 3). Finally, the SR was evaluated, proving to be a tool of great use for university students and faculty.

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Introduction

The article is situated within the framework of the TIMONEL Project based on the guidance and tutoring needs of students and graduates of different European universities, granted by public competition through the Ministerio de Economía y Competitividad of Spain. The project has been developed by the University of Jaen and the University of Granada (Spain), Queen Mary University of London (United Kingdom), and the Polytechnic Institute of Coimbra (Portugal). An aim of this study is the presentation of the recommendation system (RS) which has been established as a digital tool that responds to the academic, personal, professional, and ICT orientation needs of active students, graduates, and university teachers. The international and innovative character of the RS is emphasised, and the authors have not found any with the same characteristics which responds to the needs in terms of guidance and tutoring in any of the educational stages of the student. Furthermore, a review of the guidance and tutoring services in European universities has been made, indicating other studies mainly of a mixed nature that somewhat resemble the character of this research.

This project was born from the urgent need to respond to the evident requirements presented by university students and graduates in reference to correct advice. There are many indications within these subjects of a lack of knowledge and dedication on behalf of those in charge of offering this advice or guidance. This is why the effort has been centralised in an initial analysis of the needs of the students within the university context and of the teaching staff, in order to be able to subsequently provide them with a useful tool in their day-to-day educational environment that complements the role of the teaching staff in their advisory role. Based on a preliminary analysis, the following were determined as specific objectives of the project: to (a) detect the training needs of European university teaching staff in relation to guidance and tutoring; (b) analyse the current guidance and tutorial practice of the teaching staff in various European universities; (c) identify good practice in guidance and tutoring developed by university teaching staff; (d) design the orientation and tutoring programme for the RS; (e) implement the programme as part of the RS; and (f) evaluate the programme and the RS.

Analysing and promoting university orientation and tutoring was therefore the main objectives of the project presented above. It is also necessary to delve into the subject of guidance and the needs or weaknesses that both students and teachers encounter. The heterogeneity of students in universities has given prominence to the role of guidance as a tool to help them and other members of the educational community within this context (Skaniakos et al. 2019; Kim et al. 2015). This increased interest in a university guidance service was more visible after the establishment of the Bologna Plan in different European countries which was designed in Finland in 1999, and, which sought to improve educational quality through a transformation of the structure and plans of university studies (Hoffman et al. 2008; Colomo Magaña and Esteban Bara, 2020; Barba-Martín et al. 2020). In this aspect, guidance began to be considered as a support for the students given the changes that were taking place, in addition to it being seen as an indispensable element during the academic trajectory of the students. In turn, the European Higher Education Area (EHEA) confirmed the importance of guidance as a key in university training and in the tutoring of students as a tool for the support of a formative, guiding, and comprehensive nature of the same.

The guidance, to which university students are entitled, is aimed at responding to their academic, personal, and professional needs (Fernández and Medialdea, 2014; Kyle Capstick et al. 2019; Yon Guzmán and Hernández Marín, 2019). Attending to these three areas, comprehensive support is guaranteed in the

adaptation of the student group for each new year, and protection is provided during the years of academic development, advice, and training for a better job placement. Studies such as that of Biasi et al. (2017) showed how receiving academic, personal, and professional guidance at the university reduces different problems that students may encounter at the level of performance in studies, personal conflicts, indecision, and lack of guidance on integration into professional life.

The main visible problem in relation to the guidance service is the disparity of models of action depending on the country, university, and even the faculty who offers it and/or starts it (Vidal et al. 2003; Amor Almedina, 2020). On the other hand, we find a lack of motivation on the part of professors to carry out the guiding practice given the lack of economic incentives or validation of the activity as a merit for the curriculum of the faculty, as well as ignorance of the institutional and external services available (Asin Cala et al. 2019; Martín-Romera et al. 2020). The lack of coordination between teachers and personnel specialised in psychological counselling can also be highlighted. Getachew (2020) has shown that one of the guidance services most demanded by the students was of a personal nature, so coordination between different professionals is required.

Finally, it is also necessary to emphasise the limited knowledge of educational guidance professionals regarding the use of ICT. Studies such as that of Muñoz-Carril and González-Sanmamed (2015) show, after exploratory research, that there is a lack of taking advantage of the potential offered by ICT, and also highlight the limited use of the web to convey resources related to the various areas of educational orientation. Today, online guidance and tutoring services have become even more widespread (Zeren et al. 2020; Schartner, 2023) due to lived situations such as the COVID-19 pandemic. Students prefer to receive online rather than face-to-face guidance (Barker and Barker, 2022; Liu and Qu, 2023). However, and as previously mentioned, teachers have not been prepared for the technological challenge that this entailed. It is at this point that we can highlight the virtual activity of TIMONEL project, which is a recommendation system capable of self-feeding based on the active participation of online users.

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The project considers to what extent technologies can respond to the guidance demands presented by both tutors (in terms of support in their work) and students (in relation to their main needs during their stay at the university and at the end of it). To this end, the main objectives of the study are: 1) Detect needs in the orientation and university tutoring of tutors and university students; 2) Analyze good practices carried out in guidance and tutoring; 3) Design and evaluate a recommendation system based on the results obtained in objectives 1 and 2 to support guidance and university tutoring.

Materials and methods

Design. In accordance with the objectives presented in this research, we employed both quantitative and qualitative data collection and analysis techniques, using a concurrent mixed model (Creswell and Plano-Clark, 2017) (Fig. 1).

The mixed design in data collection offers a much clearer and more realistic perspective than other research proposals, insofar as it allows the different agents (students and teachers especially) to give their opinion and express their opinions and experiences, while at the same time the research team can make a contrast between them and the responses to the items in the questionnaires.

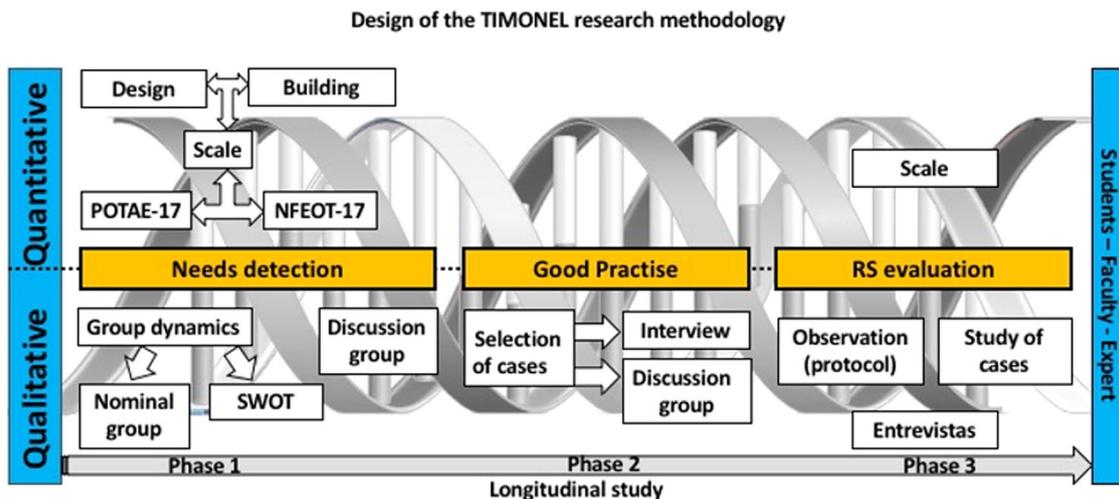


Fig. 1 Methodological design of the TIMONEL project.

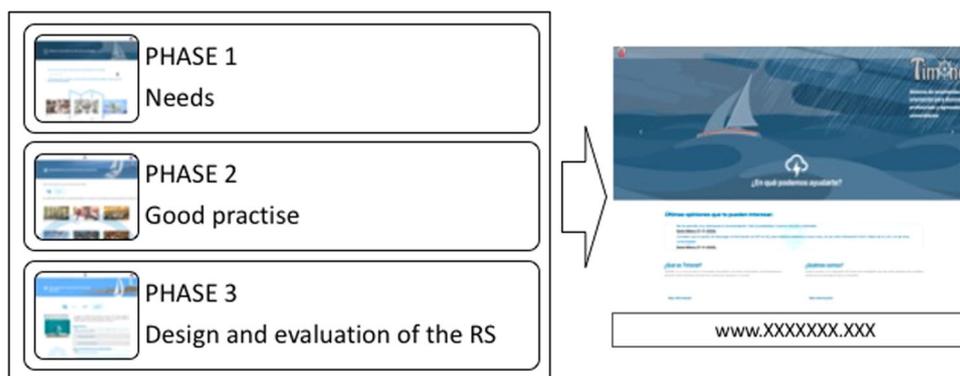


Fig. 2 Connection between the three phases of the project and the RS TIMONEL.

The contribution to the research continuum is carried out in an original way through a process of research–experimentation–innovation–research, unifying a four-year longitudinal study (2017–2020), in which the coexistence of the quantitative and qualitative approach strengthens data collection. This process follows a sequence in three consecutive phases (Fig. 2):

- (1) Phase 1 (objectives 1): This was aimed at the detection of needs and has been developed in two sub-phases: (1) assessment of training needs in guidance and tutoring; (2) analysis of the guiding and tutorial practice. The data collection procedures were developed for these purposes within the framework of guidance and tutorial action (academic, personal, professional, and ICT). Access to the views of teachers and students on these issues enabled us to establish a framework of actions for the development of the second phase of the project. This phase was delayed, like the next one, 6 months longer than expected.
- (2) Phase 2 (objectives 2): This focussed on the design of the RS in two consecutive sub-phases: the first was intended to identify good practices in guidance and tutoring developed by European and Latin American university professors, through a study of multiple cases, in order to obtain a broader view of the elements that were present in each practice. This helped us to develop a catalogue of good practice; there was also a second objective, aimed at the design of the programme itself.
- (3) Phase 3 (objectives 3): The system is currently fully developed and tested, and has been evaluated by a

significant sample of students and tutors. It has hundreds of registered users who are promptly informed of the news that occurs in it according to the concerns they have expressed. Its web address is www.timonel.net.

Participants. The complexity of the study entails different samples depending on the phases through which it is passing, Phase 1 being the one in which the most subjects have participated and the one with the most diversity. Representativeness has been guaranteed by handling the indicators and distribution shown in Table 1. Regarding the PAT, only Spanish universities are included, since it is not developed in Portugal or the United Kingdom.

The quantitative research sample consisted of a set of participants obtained through proportional random stratified sampling (except at PIC and QML, which was intentional due to the variability of the degrees and the difficulty of access to the subjects in the case of QML) with a calculated error of 5% and taking into account the variables listed in Table 2. In the cases of UJA and UGR, only common degrees were taken into consideration. The participating sample was 2779 students and 918 teachers.

Phase 2 is fully qualitative and is dedicated exclusively to the faculty. In it, three discussion groups were held (eight participants in UJA; nine in UGR; six in PIC) made up of professors from different subject fields, and this was supplemented with 11 interviews (five at UGR, six at UJA) with professors with

Table 1 Participants in qualitative study of phase 1.

Technique	Participant					
	Group	Experience	University ^a			
			UJA	UGR	PIC ^b	QML ^b
Discussion group	Students	1 ^o /2 ^o grade	4	14	4	6
		4 ^o grade/Graduate	7	11	3	6
	Faculty	Novel (- 5 years)	4	7	2	4
		Experience (+15 years)	5	7	4	3
Nominal group	Faculty	Novel in PAT	4	6	-	-
SWOT	Faculty	Experience in PAT	4	6	-	-
		Novel in PAT	4	6	-	-
		Experience in PAT	4	6	-	-

Note: ^aUJA University of Jaen, UGR University of Granada, PIC Polytechnic Institute of Coimbra, QML Queen Mary of London.
^bThey are excluded from the collection of information on PAT as this document is not established in their universities.

Table 2 Participants in quantitative study of phase 1.

	Students ^a				Teachers ^a			
	UJA	UGR	PIC	QML	UJA	UGR	PIC	QML
2 ^o grade	343	376	347	26				
4 ^o grade	338	374	154	6				
Graduate	334	397	82	2				
-5 years					141	169	13	3
+ 15 years					225	306	50	11
Total	1015	1147	583	34	366	475	63	14

Note: ^aUJA University of Jaen, UGR University of Granada, PIC Polytechnic Institute of Coimbra, QML Queen Mary of London.

experience in Plans Tutorial Action (PAT) in different areas of knowledge.

The participants in phase 3 were a total of 484 students (150 men and 334 women) and 38 teachers (21 men and 17 women). All of them were distributed among seven faculties and four universities. In the same way, several interviews and the study of some cases related to the PAT were carried out randomly.

Data collection instruments. The scales used in Phase 1 were created and validated by the TIMONEL project research team. The scale ‘Guidance and tutorial practice in students and university graduates (POTAE-17)’ obtained a value of 0.87 in Cronbach’s alpha, KMO = 0.853, and in Bartlett’s sphericity test, $\chi^2 = 6701.698$, $p = 0.000$. For its part, on the scale ‘Training needs in guidance and tutorial strategies (NFEOT-17)’, Cronbach’s alpha was 0.79, KMO = 0.939, and in the Bartlett sphericity test, $\chi^2 = 28169.969$, $p = 0.000$ (Pantoja-Vallejo et al. 2020). In both tests, an exploratory factor analysis was performed through the principal components and the Varimax rotation, and four factors were extracted through the Kaiser criteria, which coincided with the theoretical model proposed in the confirmatory factor analysis. The scales have a Likert-type format with five response options (totally disagree to totally agree) and each have 61 items.

The different qualitative instruments, such as nominal group, SWOT technique, discussion groups, and case studies and interviews, were developed by the multidisciplinary team that makes up the research team, reinforced by teachers and tutors with experience both in university teaching and in participation in PAT. In Phase 1, it was developed based on the research objectives and the main indicators that supported the aforementioned scales. In Phase 2, it did so based on the milestones to be achieved in the detection of good practice (Martín-Romera et al. 2020). In phase 3, a scale with two versions (teachers and

students) was created, which in its final version had a total of seven identification variables and 22 Likert-type items with five response options, ranging from totally disagree (1) to strongly agree (5). Broadly speaking, it can be noted that it has psychometric characteristics that support its content, construct, and reliability validity. Specifically, Cronbach’s alpha statistic reached a value of 0.89, KMO = 0.951 and Bartlett’s sphericity test $\chi^2 = 6180.038$ ($p = 0.000$). It can be completed by teachers and students, with some nuances between both types of users, which in practice are not very important. In the qualitative analysis of phase 3, open questions were included in the two previously mentioned scales. In addition, interviews were conducted with the teaching staff of the four universities participating in the project.

Data analysis. Qualitative data (in-depth interviews, discussion groups, documents) were analysed following the phases of reduction of the same (categorisation), description of the content of each of the categories, illustration of content with textual quotes and matrices, the establishment of relationships between the different topics, and the extraction and verification of conclusions. The NVivo program version 12.0 for Windows was used for this purpose. The scales (POTAE-17 and NFEOT-17) generate quantitative data, which are analysed through statistical procedures on guidance and tutorial practices in academic, professional, personal, and ICT fields. To do this, they are coded, and we went on to carry out a study of frequencies and percentages, as well as performing calculation and interpretation of measures of central tendency and dispersion. Likewise, the appropriate graphic representations are made to illustrate the results. In order to compare the data based on the analytically relevant variables, hypothesis contrast tests (tests T, analysis of variance, multivariate contrasts) are used. The statistical program SPSS is used in its version 24.0 for Mac.

Results

The extensive study has produced an enormous amount of data which is difficult to integrate into an article. For this reason, the most significant responses from professors and students have been assessed. These are the ones where it is observed that the participants have qualified, specified, or expanded in the qualitative instruments on the responses they gave in the quantitative ones, thus closing the circle established by the mixed paradigm implemented.

Phase 1: Guidance and tutoring needs/Teachers and students.

A general overview of the guidance and tutoring needs is presented (Table 3), showing the differences found for the variables of interest.

Table 3 Summary of quantitative and qualitative integrated results according to analytical variables.

Dimensions	Needs	FACULTY												STUDENTS											
		Experience						PAT						2° course						4° postgraduate course					
		-5 years			+ 15 years			Yes			No			Sig.			Sig.			Sig.			Sig.		
		Qual	Quan	Sig.	Qual	Quan	Sig.	Qual	Quan	Sig.	Qual	Quan	Sig.	Qual	Quan	Sig.	Qual	Quan	Sig.	Qual	Quan	Sig.			
AG	Advice on carrying out work	5	81.25 (11.25)	0.160	5	82.34 (11.19)	0.000	5	84.16 (10.47)	3	80.27 (11.50)	0.000	2	54.56 (10.32)	6	53.79 (11.74)	0.122								
	Academic itinerary design help	3			3			3		2			10		1										
	Different work methodologies	1			2			2		1			4		0										
	Use of study techniques	3			6			6		3			5		0										
	Teaching guides explanation	0			1			1		1			7		4										
	Motivation towards learning	2			5			5		3			16		16										
	Tutorial action regulations	1			6			5		4			1		2										
	Relationship between different subjects	7			12			7		8			8		3										
	Totals	22			40			34		25			53		32										
	Advise specialized services	1	52.76 (8.78)	0.420	1	52.25 (9.80)	0.001	2	53.54 (9.23)	1	51.41 (9.53)	0.001	0	38.43 (8.91)	1	37.28 (9.20)	0.004								
	Help conflict resolution	3			0			10		5			3		5										
	Act in situations of harassment	0			0			0		0			6		12										
	Development of emotional competencies	2			2			2		1			2		5										
Promotion of gender equality	0			0			0		0			3		7											
Promote tolerance and mutual respect	0			0			4		0			10		13											
Personal guidance	5			5			5		6			8		10											
Totals	11			8			23		13			32		53											
Vocational decision making	0	58.81 (14.70)	0.485	0	51.43 (14.97)	0.001	0	53.29 (14.86)	0	49.86 (14.61)	0.001	3	40.11 (12.43)	6	38.90 (13.15)	0.032									
Professional expectations degree	0			2			2		0			1		1											
Job skills training	2			6			6		8			2		1											
Workplace transition	3			11			11		3			12		7											
Professional itinerary design	2			12			12		2			8		8											
Preparation of the curriculum vitae	0			1			1		0			4		3											
Business practices	0			5			5		0			2		6											
How to do a job interview	0			0			0		0			0		1											
Content-output relationship profes	6			17			15		9			20		4											
Totals	13			54			52		22			52		37											
Internet job search	2	34.48 (8.82)	0.358	4	35.04 (8.76)	0.001	4	36.08 (8.39)	2	34.08 (8.86)	0.001	6	40.14 (8.32)	2	38.95 (9.20)	0.002									
Employment and internship portals	4			1			2		4			5		5											
Social network (Facebook, Twitter)	1			1			18		1			1		2											
WhatsApp or others (Remind)	3			3			2		4			5		5											
Promotion of ICT mastery in classes	0			4			3		0			1		5											

Table 3 (continued)

Dimensions	FACULTY				STUDENTS				Sig.		
	Needs				2° course					4° postgraduate course	
	Experience				PAT					Qual	Quan
	-5 years		+ 15 years		Yes		No				
Qual	Quan	Qual	Quan	Qual	Quan	Qual	Quan	Qual	Quan		
Specific forum on the platform	1	0	0	0	0	1	1	0	0		
Videoconference for tutorials	1	2	2	7	3	1	1	0	0		
Webs for subject orientation	10	3	3	14	13	1	1	3	3		
Faculty website	0	0	0	0	0	0	0	2	2		
University platform	1	4	4	9	2	8	8	11	11		
Use email tutorials	4	3	3	19	6	8	8	12	12		
Totals	27	23	23	78	36	37	37	47	47		

Based on analysis of the data, it is concluded that the correct development of guidance and tutoring has to do with an integral response that affects all dimensions, with the association between them on both scales being very high ($p < 0.01$). The qualitative analysis shows that the academic dimension is more assumed by the teaching staff as part of their work compared with the personal and especially the professional dimensions which are less assumed. This coincides with the extent to which both samples show the way in which their needs are met. Regarding this, they believe it is important that faculty must be competent in referring or advising students on specific services, which requires training. Both students and teachers allude to the need to have interest and a proactive attitude that allows information and training.

The academic dimension (169 references) stands out as a result of its presence in the discourse of students and professors in 'Advice on carrying out work', 'Tutorial action regulations', 'Help for the academic itinerary design', which alludes to the importance of a 'deep knowledge of the career that the student is studying, studies, possible itineraries, electives and everything' (NominalGroup_UJA). 'Motivation towards learning' was highlighted by students who manifest the need to establish a balance between teaching focussed on passing exams and studying content that meets their interests and updated: 'if the content is irrelevant; we don't have a motivation to study it well because we know that after those six weeks, we will never look at it again' (Students_Novel_QML). In addition, an aspect that seems to have some influence on their motivation has to do with the teacher's attitude towards the subject, 'knowing how to transmit it well' (NominalGroup_UJA), and a close relationship with the students.

The teachers allude to the fact that there are adequate services, and a willingness on the part of many professionals to support the guidance, but they state that the students 'do not make sufficient use of the available support' (Professors_QML).

Overall, there are significant differences in the means in relation to participation and non-participation in the PAT by professors ($p < 0.000$) in favour of greater participation in it. In the case of more than 15 years of experience they mention the 'Relationship between different subjects'. They indicate that, although they have the obligation to carry out the course coordination meetings, it is not a common practice and times that intrude into the working day. This is an aspect that is corroborated by the students: 'we have subjects in those that the same work serves for another subjects' (Students_Novel_UGR). They understand that establishing a joint curricular project 'requires coordination' (SWOT_UGR). This lack of coordination is also manifested in most dynamics of the tutorial action programmes: 'there was no agreement between them, and you were going to talk to the tutor and she would tell you: 'you have to talk to the coordinator of the degree' and when you went she would tell you "you have to go talk to the tutor". ' (Students_Novel_UGR).

Regarding the personal dimension (124 references), students and teachers alluded to needs related to aspects of 'Development of emotional competencies in different subjects' and 'Receiving personal guidance when needed'; 'little or no work is done on the subject of the emotions and feelings that occur in the heads of the students and at the group level' (Students_Graduate_UJA). In this regard, students and professors allude to the need for a reference person for the development of the tasks related to this dimension, favouring the development of more effective diagnostic and intervention processes. There is a difference between second-year students ($M = 38.43$; $DT = 8.91$) and fourth-year/graduates ($M = 37.28$; $DT = 9.20$) ($p = 0.004$), in this case in favour of the former.

Table 4 Needs screening (t-test).

Variables ^a	Grupos	Faculty					Students				
		M	SD	gl	t	Sig.	M	SD	gl	t	Sig.
AG	Man	80.35	11.364	916	-4.809	0.000	55.23	11.461	2845	4.184	0.000
	Woman	83.89	10.754				53.39	11.352			
PG	Man	50.60	9.770	913	-6.687	0.000	39.02	9.220	2879	5.328	0.000
	Woman	54.64	8.556				37.14	9.151			
PRG	Man	50.44	14.921	916	-1.867	0.062	40.60	12.956	2879	4.740	0.000
	Woman	52.28	14.774				38.27	12.662			
ICTG	Man	35.42	8.7899	916	2.189	0.029	40.63	8.998	2.879	3.789	0.000
	Woman	34.15	8.743				39.32	9.005			

Note: ^aAG Academic guidance, PF Personal guidance, PRG Professional guidance, ICTG ICT guidance.

The needs of the professional field (183 references) are referred to very specifically as ‘Information transition to the labour world’. Within this dimension, the need to work on the link between academia and the world of work can be seen, requiring the creation of professional networks that cater to it. The implementation of this requires meeting certain needs, such as ‘the preparation of professors on the needs of the labour market’ (SWOT_PCO), as well as structures and services available to the university to which to refer students. Overall, there are also differences between second-grade students (M = 40.11; SD = 12.43) and fourth-grade/graduates (M = 38.90; DT = 13.15) ($p < 0.032$) in favour of the former.

The ICT orientation (201) is shown as the dimension where the needs are to a lesser extent covered according to professors and students. The most indicated needs were a ‘platform for student orientation’, and a ‘website for student orientation’, indicating the need to adapt institutional tools to students’ preferences. One of the most common practices is the access in orientation to academic and professional information offering a list of web pages, but these are perceived by students as not very useful and they show a preference for tools that they understand, and which are closer and more immediate. That is why faculty allude to the need to work on training in these resources, as well as the need for attitudes that align with a ‘communication model that favours the proactive search for information’ (SWOT_UJA). Again, significant differences are observed between second-grade students (M = 40.14; DT = 8.32) and fourth-grade/graduates (M = 38.95; DT = 9.20) ($p < 0.002$).

The teaching staff attribute great importance to the existence of specialised services (structures, professionals, etc.), specifically with regard to professional orientation. Some of them indicate that the RS that is intended to be designed with the research project that supports this publication and should be designed by professional experts with professional guidance. Professors understand that a practice that works with students is to create a tool that allows them to have access to their mobile phone; in other words, an app that allows them to directly and more appropriately access their generational preferences, with other tools – such as email – not being perceived as useful.

The sex variable. The results are more illuminating in the case of students, where significant differences ($p = 0.000$) are found in all areas, as can be seen in Table 4. These differences are in favour of men in personal, professional, and ICT orientations, with very little difference for women in the academic dimension.

In this regard, the qualitative results show a greater number of references and allusions to nonsense referred to all areas by the students, especially in academic (54 versus 21) and personal (354

versus 8). They are particularly concerned about ‘orientation in the academic pathway’ (16), ‘motivation in subjects’ (20), ‘use of e-mail’ (18), ‘promoting tolerance and mutual respect’ (12) and ‘receiving personal guidance when required’ (12).

There is no professional orientation in the teaching staff ($p = 0.62$), here women obtain it in academic and personal dimensions, while men do so with regard to ICT. There is a coincidence between professors and students in the latter.

The qualitative results show us that professors in particular state that the academic and personal guidance needs of the students are specifically assumed by professors, but this is not so much the case for professional guidance: ‘that is not our function. Ours is basically the academic, the personal, and a task that is historically crucial and which we take seriously ... once they stop being our students, we are always there, ready to write professional references but that is, let’s say ... waiting for us’ (Professor_QML).

Teaching staff: Participation in the PAT. The differences found between professors participating in PAT and those who do not participate in all the dimensions analysed should be noted (see Table 3). The results show us that it is the ones who perceive that the needs for guidance and tutoring in the university context that are mostly covered, as they have a more global knowledge of the actions carried out. This is congruent with the results derived from the contrast of hypotheses regarding differences between professors who have training and those who do not. The qualitative contributions show us in all dimensions the importance of professors having training in processes, techniques, guidance, and tutoring services, in order to offer an adequate response. Likewise, they understand that: ‘This should be professionalised and it is part of your professional commitment that you have to do this and it has to have some spaces, some senses and that they give us training so that we know how to fill in content and jump beyond the subject’ (Professor_PAT_UGR).

Students: Level of studies. The one-way ANOVA reveals differences in the personal ($p = 0.016$), professional ($p = 0.002$), and ICT ($p = 0.002$) dimensions. Tukey’s post hoc test of multiple comparisons indicates significant differences between the second- and fourth-grade groups in the personal dimensions (difference between means of 1.148; $p = 0.014$) and ICT (difference between means of 1.195, $p = 0.008$), as well as between second and post-graduate degrees in the professional dimension (difference between means of 2.01, $p = 0.002$).

In the personal sphere, qualitative data show us that novel, final year and graduate students show similar needs for this dimension. However, it has a clearer and more global vision of them. New students express the greatest agreement with the statement that

Table 5 Frequencies of the categories by university.

Dimension-Categories	University ^a			
	UJA	UGR	PIC	Total
ACADEMIC				
Adapt the subject to the characteristics of the students	10	3	0	13
Coordination of curricular elements in various subjects	9	6	0	15
Publicize existing programs for further study	0	5	1	6
Detection of training needs	17	12	0	29
Strategies to motivate students towards learning	6	10	0	16
Strategies to guide students about the learning process	9	6	1	16
Participate in actions aimed at improving the PAT	4	3	0	7
PERSONAL				
Serve students with good will and availability	8	13	1	22
Know the characteristics and motivations of students	2	8	0	10
Include students in the university and group-class	3	8	0	11
Inform students of specialized university services	5	7	0	12
PROFESSIONAL				
Have knowledge and experience in the professional field of which he is a trainer	6	3	0	9
Build academic-professional itineraries and life project	6	0	0	6
Train students in skills for job placement	4	2	0	6
Inform students about career opportunities	5	18	0	23
Identify professional training needs	4	0	0	4
Report on the transition to work life	1	12	0	13
Provide guidance on professional development activities outside of the faculty	4	8	1	13
Provide guidance on company or volunteer internships (service learning)	2	2	0	4
Advise on the resources and structures offered by the university	4	2	1	7
Establish content relationships with professional opportunities	9	7	0	16
Assist in vocational decision making	2	1	0	3
ICT				
Disseminate practices in guidance and tutoring using social networks	0	11	0	11
Use tools close to the use of the students	5	9	6	20

Note: ^aUJA University of Jaen, UGR University of Granada, PIC Polytechnic Institute of Coimbra.

'in the university gender equality is promoted' (87.8%) and the postgraduate students the least (83%). However, the second-year students indicate having perceived certain particular machoistic and feminist attitudes in the teaching staff. For the new students we find accounts of experiences lived in the first person: 'I have seen male teachers, very macho. If these are the people who intend to educate social educators, we do not know what kind of social educators come out of here' (Students_Novel_UGR).

Regarding the statement 'receiving personal guidance when needed', it is also new students who agree the most (87.5%) and those in the fourth year who agree the least (83.5%). The former claim to know of some available services, but fail to conceive tutoring as a space for personal development, indicating that there are professors who may relate more to them in the fulfilment of this function. In this regard, novel students assume it as part of the tutoring, but indicate that it 'depends on the teacher' (Students_Graduate_UGR).

Phase 2: Good practices. The qualitative analysis shows coincidences in the way in which professionals working in universities (and in various areas of knowledge) conceive the most appropriate way for the development of a good tutorial practice, allowing us to draw conclusions regarding the design of the RS.

When the interviewees were asked what good practice in university tutorial action is for them, they agreed that it is to solve all the orientation questions posed by the student offering the 'best possible solutions' (courses, orientations, etc.), understanding it as a set of interrelated dimensions. It could be said that good practice should take into account all dimensions (academic, personal, and professional), which aims at achieving a comprehensive personal

intervention (Pantoja, 2020), understanding that this is essential to solve many of the problems that derive from the tutorial practice – such as the demotivation or negligible proactivity of the students when making use of the tutorial action plans – or the scant assumption of responsibilities of the agents involved. Likewise, they highlight the importance of an integrated conception of tutoring where it is shared by all the agents involved and is aimed at 'creating culture' which requires necessary, more extensive, and shared institutional structures and support, and that this is reflected in a balanced treatment of them in their design.

In addition, the guidance practice must be characterised by support throughout an academic career, attending to students' needs at all times. Good practice must adapt and match the times between students and professors, as well as being flexible in terms of space and time. In addition, they consider it important to identify guidance needs paying attention to the context of the students.

This analysis revealed a common situation regarding the constant availability for the exercise of tutoring, which derives from a large amount of time invested in the development of virtual tutorials outside official hours, and which goes further, with staff acting as counsellors with students who have graduated. This demand for accessibility defines a practice that must be characterised by a good command of the tools for the development of tutoring (diagnosis, information management, and groups and communication among others) and of the services (that the institution and, beyond that, society puts at your disposal) that allow the development of guidance in all its facets. This offered us valuable information for the design of the RS, taking into account good practices, in terms of techniques and necessary services, for each of the dimensions which were defined as concrete recommendations based on the proposals of the participants (See Table 5).

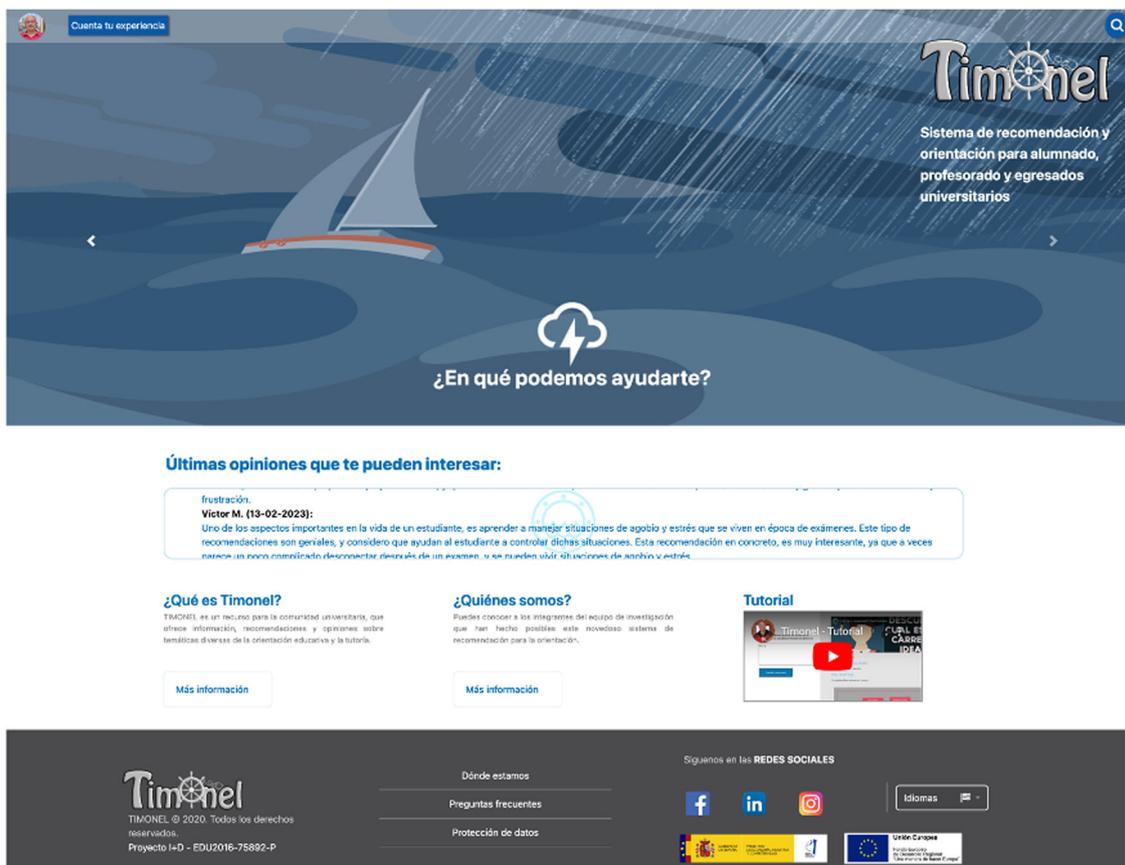


Fig. 3 Recommendation system TIMONEL (www.timonel.net).

Phase 3: Design and evaluation of the RS. Once again, the mixed nature of the investigation is recovered in this last phase of the investigation. It is of special interest here to collect the impressions, opinions, and suggestions of all the agents who intervene as actors in the new RS. For this, the different components that shape TIMONEL are analysed in depth, taking as a reference the guidance programme developed. Figure 2 shows the interrelation between the three phases that make up the RS and the final result in the form of a Web page.

The aspects that were detected and considered in Phases 1 and 2 and are put into practice in the UJA orientation programme:

- Identification of the problem > Generating questions.
- Analysis of possible alternatives > Prioritisation.
- Analysis of alternatives > Selection.
- Simulation of the alternative > Real implementation.

This theoretical sequence is put into practice in the RS TIMONEL, where the user, once registered, can interact with the available information and save the recommendations obtained to consult them on another occasion (Fig. 3).

The evaluation of TIMONEL reveals similar evaluations in students and teachers in the academic, personal and professional fields, indicating the ease of use, allowing new ideas to be obtained, applying it to the subjects or being a good support for the student and tutor. Some contributions showed elements for improvement such as the selection of resources in a more strategic and specific way, the development of a resource that summarizes the operation of TIMONEL or the need to specify some content.

The users scored higher with respect to the variable users referring to the type of recommendations received when they came from the collaborative network with respect to those that

incorporated the system itself. No different evaluations were observed depending on the age of the teaching staff. In the case of students, those over 42 years of age, that is, graduates, are the ones who best value TIMONEL.

Regarding the four parts that make up the guidance program implemented in the RS and its influence on the response time that the system offers its users, a regression analysis was carried out in two different models: students and teachers, taking as a dependent variable “The recommendations received have been to my liking” (item 1) and as covariates age, sex and the four items that represent the phases of the SR (items 15, 2, 3 and 9). Both models are statistically significant ($p < 0.001$) and the first one explains 67.6% of the variance of the dependent variable and the second 63.8%. Age and sex do not intervene in the effectiveness of the RS, so it can be affirmed that the RS does not distinguish these features of the user, which reaffirms the objectivity of the user’s responses. In the case of students, a clear association is verified between the satisfaction with which the problem has been solved and the four phases of SR already mentioned, while in the case of teachers it can only be seen in the existence of possible alternatives and their analysis.

TIMONEL’s overall assessment is very positive. Students and teachers agree that the recommendations received can help to obtain new ideas. 91.5% of the students would recommend it to their friends, while 86.8% of the teaching staff would recommend it to their university colleagues.

The qualitative instruments collected as more significant data the different perceptions how university tutoring was understood, ranging from aspects that could improve what TIMONEL is and offers, to a more personalised vision of the platform with ideas on

how to include new information and categories. For example: ‘It offers a wide bank of resources on which to learn about aspects that have to do with the tutoring of students and allows us to continue advancing in our work. It is fast in terms of providing immediate solutions’ (Professor_PAT_UJA).

Discussion and conclusions

The main conclusions are detailed below according to the three main objectives that were set. With respect to objective 1 “Detect needs in the orientation and university tutoring of tutors and university students”, there is a concern in the students for issues such as educational itineraries, motivation and coexistence. Teachers do not carry out career guidance. It is evident that the participants in the PATs have a clearer vision of the needs that remain unresolved, especially the training in tutoring by teachers (Pantoja Vallejo et al. 2022). On the other hand, differences have been observed in the opinions of students with little experience in the university and those who have finished their studies in terms of the professional dimension, evidence that it is at the end of the studies when this lack is most appreciated. A notable sensitivity towards the recognition of gender equality is detected, although more initiatives are still needed.

The second of the objectives mentioned “Analyze good practices carried out in guidance and tutoring”. The preparation of tutors and the ability to resolve doubts in guidance is one of the best valued good practices, because they allow adequate comprehensive training of the student to be achieved (Guzmán, 2018; Fernández-Nogueira et al. 2018; Gonzalo et al. 2020). Accompaniment throughout the degree obtains a double assessment, as it is considered a necessity, but at the same time a good practice by certain tutors. In the same way, it is verified that there are tutors who have an excellent preparation in diagnosis, group management, communication, etc. Authors such as Rodríguez Ugalde et al. (2018) have emphasised the lack of studies on good teaching practices in guidance and tutoring and the urgent need to expand this field of research to provide a better and more specific responses to the needs of students. In addition, and in consideration of the prospects of the new TIMONELA project (successor to TIMONEL but with the objectives set in Compulsory Secondary Education and Baccalaureate), a good practice is the projection of the entire compulsory educational system and post-compulsory in the training of teachers, promoting actions that situate guidance and tutoring in their corresponding places as teaching practices (Aguilera García, 2019).

The third and last objective of the study was “Design and evaluate a recommendation system based on the results obtained in objectives 1 and 2 to support university guidance and tutoring.” The main conclusion does not lead to affirm that the construction and subsequent evaluation of TIMONEL has managed to respond to the deficiencies detected in phases 1 and 2 of the study, in terms of offering alternatives to the demands for guidance in the academic, personal and professional, do it in the form of simple proposals adapted to users in a friendly environment (www.timonel.net) and offer a wide range of opinions and experiences of other users in a collaborative way. Both students and teachers coincide in indicating the ease of use of RS, being useful for obtaining new ideas and serving as a reference in university tutoring.

Finally, it is worth highlighting some strengths, limitations and prospective of the study. In the first place, it is a long-term investigation in which the needs and good practices have been taken as a reference to build the RS, reversing in it the opinions of counselors, students and tutors, who, after all, their protagonists and users. The collection of information through techniques and

instruments of quantitative and qualitative origin, has allowed obtaining much more complete data. As the main limitation we highlight the difficulty for the construction of TIMONEL, due to its conception, structure and content arrangement, totally unpublished, and the requirement of its constant updating. The future leads us to improve content, incorporating tools and applications that facilitate a higher quality response, and at the same time, incorporate more complete user opinions and experiences.

Data availability

The data analyzed in the study are available to the reader upon request to the authors, and in the supplementary files.

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Competing interests

The authors declare no conflict of interest.

Ethical approval

We confirm that the study has been approved by the ethics committee of the different participating universities: University of Jaen and University of Granada (Spain), Polytechnic Institute of Coimbra (Portugal) and the Queen Mary of Londo (United Kingdom). Once the project was granted and before beginning the study, approval was requested from the ethical commissions.

Informed consent

All participants signed the informed consent where the objectives of the project were outlined. It was given to the participants before they filled out the scale.

Additional information

Supplementary information The online version contains supplementary material available at <https://doi.org/10.1057/s41599-023-01945-y>.

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