From high school to University: guiding tools for the choice of the degree course

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1. EXECUTIVE SUMMARY

The impact of the University system on young first-year students is often a source of doubt, uncertainty and disorientation due to educational provision, teaching methods, type of assessment, teacher-student relation, etc. that are very different from the ones experienced at high school. The choice of the degree course is the first major decision that young people have to make in life. In so doing, they have to consider multiple factors, such as their skills and inclinations, their cultural interests as well as future employment prospects. The difficulty of this choice is confirmed by the fact that there is one drop-out in every five students who enrol on a degree course. In addition to this figure – which alone shows the extent of the problem – one should consider the opinion of those who achieved graduation but regret their degree choice now, having changed their mind about it (21% of them would enrol on another degree course if they could do it all over again) [1].

Universities have tried to deal with this problem by setting up guidance offices and publishing very useful online self-assessment tools which help students assess their knowledge, skills and inclinations towards a specific area of study.

Established by the University of Bologna in 1994, the AlmaLaurea Interuniversity Consortium [5] currently includes 51 Italian universities and is a privileged observatory for the whole country. The consortium is mainly aimed at supporting high school leavers from the very early stages of their degree choice. Such support is carried out by means of an online guidance tool so that school-leavers can become familiar with and deepen their knowledge of higher education, as the University system has undergone rapid developments since the 2001 reform, which implemented the guidelines of the Bologna process.

The guidance tool is similar to an online questionnaire subdivided into different sections. Users are first asked to fill in some information about their geographical origin, personal and school data. Afterwards they have to fill in 4 different forms covering different aspects of the question in order to: i) become aware of his/her strengths and weaknesses; ii) obtain in-depth knowledge of the post-reform University system; iii) explore the University educational provision according to his/her own cultural interests; iv) explore the various study areas on account of his/her own personal aspirations.

Once all the sections have been filled in, the application shows an overall picture which sums up the results obtained from the entered data and identifies a guiding profile. The latter should be the starting point for embarking on the complex process of guiding the choice, a process which will require further in-depth investigation. The summary picture also contains valuable references to other sources of information, namely education guidance websites of the various Universities. Developed by means of a Web application, this system is designed to generate a guiding profile after storing all the collected information to be used for further surveys and in-depth scientific analysis. It was advertised to the public on the Website www.repubblica.it, which is the online version of one of the two top Italian daily newspapers.

The aim of this paper is to describe the structure of the online service as well as the results obtained in terms of use and quality of the collected information.

2. Background

All the school-leavers who want to continue their studies and take a degree are faced with the problem of choosing the best course of study. Everybody knows how difficult and delicate such a decision is, as their future is at stake: choosing a degree course which is suitable for their skills, meets their personal preferences and, last but not least, takes into account their professional aims is no easy task. Being able to make a decision according to objective elements is extremely rare in life. Elements that can help us decide are often blurred and incomplete and the decision is to be made with the help of subjective elements which are, by definition, changeable.

This does not mean that decisions are to be made at random or only according to our own feelings. It is essential to reduce the grey area to the maximum, clarifying the problem and defining its limits. In other words, we must analyse, know and understand the framework within which our decision is to be made.

Back to our main issue, a student faced with the degree choice should first analyse and understand fully the world of university. In Italy, a school-leaver can choose among about 3,000 different first-level degree courses (three-year courses) and second-level single-cycle degree courses (for instance, degree courses in Medicine). Courses are classified according to 40 different degree courses groupings (*classi di laurea*) which have been defined by the Ministry for Education. The fact that a course belongs to a specific degree course grouping entails a combination of the subjects to be taught. Universities can organise courses where different subjects are taught, provided that these comply with the standard criteria set for that specific grouping.

Except for the exclusively distance-learning ones, the overall number of Italian universities is 78, with campuses scattered across the country and even abroad, as it is the case of the Bologna University.

Clearly, degree courses are also different because of the job prospects they offer in the short, medium and long term. Employment prospects must be distinguished not only in terms of earnings but also according to other subjective elements such as independence, balance between private life and career, stability, professionalism development, better career prospects, all elements which are often more significant than income itself.

Moreover, understanding the university for school-leavers also mean becoming accustomed to new studying methods and harder workload than the ones they experienced while at secondary school. They are required to grow up and to develop cross-cutting competences, such as consistency as well as capacity to achieve the targets set and to face the unexpected, which are crucial to overcome any difficulty that may arise during their university course.

Therefore, it is essential for them to build up a clear picture of the whole framework as well as identify both their strong and weak points and the opportunities and threats that different choices might bring about.

This complex framework is even more ill-defined due to the ever-changing society and labour market, on the one hand, and the consequent deep change the university system is undergoing, on the other.

The so-called University reform has been implemented since 2001, thus changing the whole Italian and European university system according to the guidelines of the Bologna process. Assessing the reform's outcomes, or better, the way it has been enforced is not yet possible and, even so, is not the aim of this paper. However, the entire course of action leading to the degree choice has been complicated even further.

3. Alternatives

There are outnumbered initiatives aimed at higher education guidance. Each university has set up a specific body devoted to this issue. Universities and single faculties organise events and open days to show their facilities and introduce their educational provision and degree courses. Several tools are available on line. Moreover, the Ministry for Education makes the database of university educational provision available for consultation by the general public [7].

As to the universities taking part in the initiative, the Almalaurea Consortium has long been publishing a yearly report where the internal degree of effectiveness (profile) [1] and its external

one (employment and training conditions) are analysed [2]. Such surveys can provide recent school-leavers with very useful information on the difficulties, number of graduates, future employment prospects of each specific course of study. However, developing an online application which, like a wizard program, can identify the ideal course of study by means of a questionnaire, is just a pipe dream.

The final choice is up to school-leavers, but only after they have fully understood the framework within which their choice is to be made.

4. Alma Orientati (Alma-guide yourself)

The questionnaire has been designed by a team of psychologists, sociologists, statisticians and computer scientists coordinated by the AlmaLaurea Interuniversity Consortium. Besides working as an aptitude test relevant to the choice of the degree course, the questionnaire is an important opportunity to gather reliable information on the Italian university system's main features and performance. Information is based on both AlmaLaurea surveys and other reliable studies and databases at national and European level, namely the Italian Ministry for Education, University and Research (MIUR), the National Committee on the Assessment of the University Systems, Istat (national statistics institute) and the OECD. As for the information obtained from the AlmaLaurea surveys, it focuses particularly on the experience gained by university students who studied at university and entered the labour market before you.

4.1. The AlmaLaurea Consortium

AlmaLaurea is an innovative service that puts graduate CVs and résumés online, so as to provide a meeting point between Graduates, Universities and Corporations. The number of online CVs reached 1 000 000 at the beginning of 2008, involving graduates from 51 Italian Universities. About 180,000 new CVs are added to the database every year.

Founded in 1994 on the initiative of the Statistical Observatory run by the University of Bologna, AlmaLaurea has grown exponentially and includes 67% of Italian graduates every year.

Managed by a consortium of Italian universities with the support of the Ministry for Education, University and Research, AlmaLaurea was set up with a view to putting businesses and graduates in contact with one another and becoming a reference point for everyone involved (e.g. scholars, university staff, etc.) in higher education, employment and the development of young people as a whole.

Every year, AlmaLaurea publishes two analyses on Italian graduates:

Annual Graduate Profile Report [1].

The report examines all the year's graduates sorted into university, faculty and degree course. Graduates' characteristics and performance are analysed in the light of a multitude of variables, namely age at graduation, examination scores, graduation grades, continuity of studies and attendance, parents' education, social class background, school-leaving diploma and marks, diligence in attending classes, study abroad, use of laboratories, apprenticeships or internships, time spent preparing thesis, evaluation of university experience, knowledge of foreign languages, IT skills, working experience during studies, intentions for further study, preferred branch or sector of employment and characteristics of the type of job being sought.

Usually published in late May following the year under investigation, the Report meets not only the needs of university administrations and accreditation bodies but also the demand for up-to-date, reliable information provided directly by the person in question (who is engaged in choosing the ideal pathway to higher education), their family and vocational guidance counsellors.

The Report is available in both a paper and digital version. Documents can be consulted on the Internet, using the following URL: http://www.almalaurea.it/eng/universita/profilo/ where it is also possible to make comparisons between different years.

Annual Report on the Occupational Conditions of Graduates [2].

The Report provides in-depth information, ordered according to university and faculty, about the occupational conditions of young graduates one, two, and three years on from degree completion, job prospects as well as the relation between university studies and occupational opportunities.

Like the Graduate Profile Report, this Report is available in both a paper and digital version. Documents can be consulted on the Internet, using the URL: http://www.almalaurea.it/eng/universita/occupazione/ where it is also possible to make comparisons with previous years.

4.2. AlmaOrientati

The guidance track consists of 4 steps:

1. Identify your strengths.

2. Are you informed about the university system and the labour market? Get familiar with some of their features.

3. Look for your course of study. Identify degree courses according to your favourite subjects.

4. What do you want to be when you're grown-up? Are you an ambitious ant or an Alpine eaglet? Assess your career ambitions to better choose your university course.

Each stage includes a series of questions to be answered by the user so that, at the end, a rough profile is developed which sums up the results of the analysis made according to the answers collected per each section and gives users cues for further reference.

Each section of the guidance track will be analysed in the following paragraphs, starting right from the final result, which is shown to the user only on the last page.

4.3. Identify your strengths.

Users are shown some statements about their attitude towards education, an assessment of their studying method and the awareness of their personal resources.

At this point, they have to express how much they identify with the content of each sentence (not at all, not much, quite a lot, much or very much).

For instance, here are some of the sentences submitted:

Even if I don't like a task, I carry it out

I like enjoying different experiences

I study regularly the subjects I don't like too

I can plan early my schooling commitments

Before acting, I weight up the pros and cons.

I focus on what I am doing until the end

I deal firmly with difficulties at school

Fig. 1. View of the first page in the section "Identify your strengths".

On the basis of the 20 answers given by users in this section, the final profile sums up the user's features according to the following criteria, which are particularly important when it comes to face the challenges of university:

> *Studying method, School performances, Value of education, Preferences and interests, Open-mindedness to new ideas, Analytical capacity, Capacity for facing the unexpected, Focalisation on the target.*

Answers are designed by combining pre-arranged texts which describe the personal profile obtained according to the points scored per each answer given by the user.

More specifically, the following extract from the profile, which focuses only on 3 of the aspects listed above, highlights some weaknesses that the aspiring university student should spot and overcome on the basis of the answers provided.

> *Studying method. The experience gained from your secondary education has not been sufficient to develop a personal studying method. Such a gap may lead to difficulties during your degree course as study planning will rely only on you and you may risk not keeping up with exams or not obtaining results in line with your efforts.*

> *Preferences and interests. You have not yet focalised what you want to do in your future. No field of study or work triggers any specific interest according to your answers. You need to think of this issue more carefully, possibly exchanging opinions with other people (parents, teachers or friends) or even with guidance counsellors.*

> *Focalisation on the target. You declared yourself as someone who finds it difficult to complete a task. Be careful, as any kind of university course you will choose entails a long and demanding experience. There is the risk that you might grow weary along the way or lose your motivation for the final aim. When choosing, try not to underestimate timing and difficulties of the whole course!*

4.4. Knowledge of the university system and labour market.

Users fill in a short multiple-choice questionnaire aimed at assessing their knowledge of both the university system and labour market. This section uses the data provided by AlmaLaurea pertaining to employment conditions.

The aim of this section is to trigger curiosity about these issues, also inviting users to deepen their knowledge through the sources listed in the reference section.

The following questions have been designed to allow deeper knowledge of some aspects within the university system and the labour market. Only one answer can be given per each question, the one that seems to be closer to real facts according to the user. It is not required to give the correct answer and no assessment of outcomes is made in this section as the overall aim is to provide further information to whom is answering the questions. As a matter of fact, correct and well-documented answers are then provided on the following page. The tailor-made profile at the end of the Almaorièntati track also contains all the relevant information (references, webpages, etc.) to further investigate these topics.

However, filling in this section with maximum care is essential, as crucial information is provided that may be useful, if not fundamental, to make the best possible use of the following part.

Sample questions

> *Degree courses on which one can enrol after secondary school are grouped in degree classes. All the courses belonging to the same class share the same overall educational goals. Do you know how many classes a school-leaver can enrol on?*
>
> o About 30
>
> o About 40
>
> o About 50
>
> o About 60
>
> *In your opinion, how many graduates are in employment 5 years on from graduation?*
>
> o 55% of them
>
> o 65% of them
>
> o 75% of them

o 85% of them

Correct answers are immediately shown on the following page, showing whether the answer given was correct or wrong and providing a detailed explanation.

Sample answers

Degree courses on which one can enrol after secondary school are grouped in degree course groupings. All the courses belonging to the same grouping share the same overall educational goals. Do you know how many groupings a school-leaver can choose from?

About 30

About 40

About 50

About 60

Correct answer

They are about 50. Students with a school-leaving certificate can, as we mentioned before, enrol on a three-year (or first-level) degree course selected among 47 degree course groupings plus 6 other groupings which include 'single-cycle' specialist degree courses.

In your opinion, 5 years on from graduation, how many graduates are in employment?

55% of them

65% of them

75% of them

85% of them

Wrong or blank answer

According to the results of the 9th Survey on Occupational Conditions of Graduates carried out by AlmaLaurea in 2006, 85.3% of graduates were employed 5 years after graduation.

4.5. Looking for the course of study

This section allows users to browse the database featuring the educational provision of Italian universities. The database navigation is guided according to the aspiring students' possible favourite subjects.

Users have first to express their preference for each of the 29 basic subjects listed, by means of a scale of values ranging from 0 (minimum level) to 10 (maximum level).

The system then shows a list of degree courses available in the database which are itemised according to the student's preference for each subject.

Educational provision database

This is possible thanks to the available Educational provision database[7] of the first- and second-level degree courses managed by the Cineca Interuniversity Consortium on behalf of the Ministry for Education. The database is updated on a yearly basis by university staff from each university and is available for online consultation.

The database contains detailed information on the structure of every degree course, its organisation, goals and teaching methods. Moreover, it specifies the degree subject areas of reference for the classes prescribed in the course curriculum and gives instructions on the number of credits envisaged per each degree subject area.

Degree subject areas are regulated by Italian laws and regulations [8]. The relevant law decree lists over 400 different *subject areas,* grouped according to 28 micro-areas, which are further divided into 14 areas. Each sector is further defined by a declaratory judgement which specifies its content.

AlmaOrientati adopts the second level of the classification (i.e. the 'micro' areas), with slight adjustments that can be summed up as follows:

1. The area of Medical Science has been split into two branch subjects, namely *Nursing Sciences* and *Applied Medical Techniques* (to be trained as radiology technicians, midwives, etc.) and *Medical Sciences* (excluding Nursing Science and *Applied Medical Techniques);*

2. compared to the ministerial nomenclature, some subjects have been renamed so as to become more familiar for AlmaOriéntati users.

Calculation of answers

The curriculum of each degree course within the Educational provision database is represented by a vector of M=29 elements, where each element of the vector represents the number of university credits (CFU) prescribed for each *degree subject area.*

The 29 preferences given by each user to each of the proposed subjects (which correspond to the degree subject areas) are, in turn, represented by a vector of M=29 elements.

The scalar product of this two vectors combines the degree course content with the user's preferences thus representing a real popularity rating for that specific course in the user's opinion. The more the user's favourite subjects correspond to the ones included in each course, the higher ratings will be. On the contrary, the rating will fall, or even will be equal to 0, if the curriculum includes subjects that rank low among the user's preferences.

Over 3,000 degree courses are contained within the database. They are re-arranged and shown to the user on the last page of the guidance track.

Data are displayed in succeeding webpages:

1. Summary list itemised according to degree course groupings (**Errore. L'origine riferimento non è stata trovata.**).

2. Detailed list of the courses available within the selected degree course groupings (**Errore. L'origine riferimento non è stata trovata.**).

3. Detailed information on the course, which is retrieved directly from the educational provision website.

Summary list itemised per degree course grouping

Degree course groupings are defined at national level and set a sort of template to be used as a model for the course content. As a matter of fact, courses belonging to the same grouping are very similar and share a great deal of subjects areas. Of course, although adhering to the basic template provided for by the grouping, each university can organise its own courses autonomously so that slightly different degree courses can be offered .

Courses are itemised according to degree course groupings in the first summary list, thus allowing easier consultation. The summary table shows, per each grouping, the number of available courses in the database, also showing the maximum and minimum preference given to the different courses.

Detailed list of the courses available within the selected degree course groupings

The detailed list includes all the courses available within the selected degree course groupings, which are always rated according to preference. Differences among courses, particularly among the high-ranking ones, are often very subtle or practically non-existent.

For each course, the relevant university, campus(es) and Faculty are shown in the summary list.

Users can limit their search to degree courses offered in a specific region. In such a case, the list will only include classes and courses offered within the specified region.

Lastly, it is also possible to understand when the user's preferences bias the rating of courses that are available in terms of educational provision. A diagram shows the distribution of courses according to their score, usually a bar chart like the one shown in Fig. 4.

Classi di laurea più vicine alle tue preferenze

CLASSE tra parentesi è riportata la sigla ufficiale della classe	numero dei corsi di laurea	i corsi di questa classe hanno punteggio (su scala 0-10) compreso fra		VISUALIZZA I SINGOLI CORSI ATENEO PER ATENEO
		MAX	MIN	
scienze e tecnologie informatiche - 3 anni - *(classe 26)*	57	**10**	**7.5**	[corsi]
scienze matematiche - 3 anni - *(classe 32)*	49	**9.9**	**8.7**	[corsi]
ingegneria dell'informazione - 3 anni - *(classe 9)*	139	**9.5**	**7.3**	[corsi]
scienze e tecnologie fisiche - 3 anni - *(classe 25)*	54	**9.3**	**8.2**	[corsi]
scienze statistiche - 3 anni - *(classe 37)*	32	**8.9**	**6.2**	[corsi]
ingegneria industriale - 3 anni - *(classe 10)*	165	**8.8**	**5.7**	[corsi]
scienze e tecnologie chimiche - 3 anni - *(classe 21)*	61	**8.6**	**7.4**	[corsi]
scienze sociologiche - 3 anni - *(classe 36)*	24	**3.1**	**1**	[corsi]
scienze del servizio sociale - 3 anni - *(classe 6)*	48	**2.9**	**0.8**	[corsi]
odontoiatria e protesi dentaria - 5/6 anni - *(classe 52/S)*	34	**2.7**	**1.3**	[corsi]
medicina veterinaria - 5/6 anni - *(classe 47/S)*	14	**2.6**	**1.7**	[corsi]
professioni sanitarie, infermieristiche e professione sanitaria ostetrica - 3 anni - *(classe SNT/1)*	104	**2.1**	**0.9**	[corsi]
giurisprudenza - 5 anni - *(classe LMG/01)*	60	**1.5**	**0.2**	[corsi]
scienze giuridiche - 3 anni - *(classe 31)*	26	**0.8**	**0.2**	[corsi]

Fig. 2. Summary list itemised by degree course grouping. List of courses (itemised by degree course grouping) sorted by preferences. The table shows only items at the top and at the bottom of the list respectively (translations in Tab. 1).

Tab. 1. Translations of labels in Fig. 2

DEGREE COURSE GROUPING (official code in parentheses)	Number of degree courses	Courses in this grouping score between (on a scale 0-10)		View courses sorted by university
		MAX	MIN	
IT Sciences and Technologies –3 years – (GR. 26)	57	10	7.5	View courses
Mathematics –3 years – (GR. 32)	49	9.9	8.7	View courses
IT Engineering –3 years – (GR. 9)	139	9.5	7.3	View courses
Physical Sciences and Technology –3 years – (GR. 25)	54	9.3	8.2	View courses
Statistics –3 years – (GR. 37)	32	8.9	6.2	View courses
Industrial Engineering –3 years – (GR. 10)	165	8.8	5.7	View courses
Chemical Science and Technology –3 years – (GR. 21)	61	8.6	7.4	View courses
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Sociology –3 years – (GR. 36)	24	3.1	1	View courses
Social Services Sciences – 3 years – (GR. 6)	48	2.9	0.8	View courses
Dentistry –5/6 years – (GR. 52/S)	34	2.7	1.3	View courses
Veterinary Medicine – 5/6 years – (GR. 47/S)	14	2.6	1.7	View courses
Health Professions, Nursing and Obstetrics – 3 years – (GR. SNT/1)	104	2.1	0.9	View courses
Law – 5 years – (GR. LMG/01)	60	1.5	0.2	View courses
Legal Sciences – 3 years – (GR. 31)	26	0.8	0.2	View courses

AlmaOrièntati

Conoscere e valutare: orientamento alla scelta universitaria

Il tuo corso di laurea per ateneo, sede e facoltà

Seguendo il link [info] nell'ultima colonna si accede alla presentazione completa del corso (archivi Ministero dell'Università e della Ricerca).

Corso di laurea	Ateneo	Sede del corso	Facoltà	Punteggio	Scheda MUR
ingegneria informatica	Parma	PARMA	Ingegneria	9.5	[info]
corso di laurea in ingegneria delle telecomunicazioni	Napoli - Federico II	NAPOLI	Ingegneria	9.5	[info]
ingegneria informatica e della automazione	Ancona	FERMO, ANCONA	Ingegneria	9.5	[info]
corso di laurea in ingegneria informatica	Napoli - Federico II	NAPOLI	Ingegneria	9.5	[info]
ingegneria dell'informazione (automazione, elettronica, informatica, telecomunicazioni)	Ferrara	FERRARA	Ingegneria	9.5	[info]
ingegneria delle telecomunicazioni	Bologna	BOLOGNA	Ingegneria	9.5	[info]
ingegneria dell'informazione	Roma - La Sapienza	LATINA	Ingegneria	9.5	[info]

Fig. 3. List of degree courses in a specific subject grouping (translations in Tab. 2).

Tab. 2. Translations for labels in Fig. 3.

Degree course	University	Campus	Faculty	Score	MIUR fact sheet
IT Engineering	Parma	Parma	Engineering	9.5	info
Telecommunications Engineering	Napoli- Federico II	Napoli	Engineering	9.5	info
IT and Automation Engineering	Ancona	Fermo, Ancona	Engineering	9.5	info
IT Engineering	Napoli- Federico II	Napoli	Engineering	9.5	info
IT Engineering (Automation, Electronic, IT, Telecommunications Engineering)	Bologna	Bologna	Engineering	9.5	info
IT Engineering	Roma – La Sapienza	Latina	Engineering	9.5	info

Fig. 4. Distribution of courses according to preference level

4.6. Assess your career ambitions to better choose your university course

This section of the guidance track is set up thanks to the survey of graduate employment which is carried out by the AlmaLaurea Interuniversity consortium [2] on a yearly basis.

The survey, which is aimed at focussing on post-graduation employment and training, includes all the university students who graduated in the summer session of the universities that are members of the consortium. Graduates are contacted by phone (CATI methodology) one, three and five years on from degree completion. The analysis shown in this section has been carried out on a sample of 20,000 pre-reform degree-holders who graduated in 1999 and 2000 and were interviewed five years on from degree completion.

In the yearly survey, degree-holders are interviewed about their level of job satisfaction according to 14 different criteria, namely job security, relevance to their university studies, professionalism development, professional prestige, relevance of job to their cultural interests, social usefulness of their job, independence or autonomy at work, involvement and participation in decision-making at work; flexible working hours and time; amount of rest time; workplace; relation with workmates; future economic prospects and better career prospects.

The data collected from the sample of degree-holders were grouped in clusters according to their answers. As a results, 10 different profiles were identified as regards higher or lower levels of job satisfaction according to the 14 criteria and the specific course of study completed.

Each profile was coupled with a picture representing one of the 10 animal icons which have become the mascots of the guidance track.

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The clustering was carried out starting from the opinions expressed about 14 items on a rating scale from 1 to 10. As it is usually done in literature, such issues should be tackled by taking into account possible "size effects". Hence, in our case as well, a preliminary change was made in the data so as to standadise the opinion expressed by each user in a non-linear way, but rather according to the average opinion and the variation field expressed by each user [6]. The clustering was carried out on 4 latent dimensions. Moreover, thanks to the Ward's algorithm, 10 groups of young people were identified among those defined as employed graduates in the AlmaLaurea Survey on Occupational Conditions of Graduates 5 years on from degree completion and who graduated in 1999 and 2000. A 'reproprotioning procedure'[1] was applied to this group in order to make it the sample of all Italian graduates. The clustering was then interpreted in the light of the other information available on the people already included in AlmaLaurea databases, but chiefly in the light of the 14 satisfaction criteria. As a result, the 10 groups of young people were described by means of a label to evoke their key features. The label is an animal icon, often combined with an adjective for a more detailed description. Tab. 3 shows the key features of each cluster expressed as percentage weight and name evoking the relevant semantic content.

Tab. 3. Key features of each cluster expressed as percentage weight and name evoking the relevant semantic content.

Cluster	Perc. weight	Name	Satisfaction >average	Satisfaction <average
1	11.37	Alpine eaglet	Participation, independence, flexibility, prestige, relevance, professionalism, career, earnings, cultural interests	Workmates, workplace, rest period, job security, usefulness
2	6.75	House wolf	Earnings, career, independence, flexibility, participation, prestige, usefulness	Relevance, job security, professionalism, cultural interests, rest period, workplace, workmates
3	7.23	Rampant lion	Earnings, career, prestige, professionalism, participation, cultural interests, job security, workmates, independence, workplace, relevance	Rest period, flexibility, usefulness
4	9.72	Mediterranean dolphin	Professionalism, cultural interests, relevance, prestige, usefulness, participation, career, earnings	Flexibility, rest period, workplace, workmates, independence, job security
5	11.79	Ambitious ant	Job security, relevance, professionalism, career, earnings, prestige, workmates, cultural interests	Independence, flexibility, participation, usefulness, rest period, workplace
6	14.14	Platypus	Cultural interests, relevance, usefulness, professionalism, rest period, workplace, flexibility, workmates, prestige	Job security, earnings, career, participation, independence
7	8.09	Zorro's horse	Usefulness, rest period, relevance, cultural interests, job security	Earnings, career, prestige, workmates, participation, professionalism, workplace, independence, flexibility
8	9.2	sneaky cat	Independence, flexibility, rest period, participation, workplace, workmates	Relevance, professionalism, cultural interests, job security, prestige, career, earnings, usefulness
9	12.29	watchdog	Job security, workmates, workplace, earnings, career	Social usefulness, cultural interests, relevance, professionalism, flexibility, prestige, participation, rest period, independence
10	9.43	Garden tortoise	Rest period, job security, workplace, flexibility, workmates	Prestige, professionalism, participation, cultural interests, career, relevance, earnings, independence, social usefulness

[1] For further reference, cf. A.Cammelli, La condizione occupazionale dei laureati, IX Indagine AlmaLaurea, 2006, p.4 [2].

The cluster analysis was carried out through a well-defined characterisation strategy, which is typical of the 'thémascope' approach to the multi-varied data analysis [3]. More specifically, to characterise a group 'k' by means of continuous or quantitative variables X, this method computes a test 't' which measures the distance between the mean of the $\overline{X}_k$ group and the mean of the $\overline{X}$ population in terms of root-mean-square deviation:

$$t_k(X) = \frac{\overline{X}_k - \overline{X}}{s_k(X)} \qquad \text{where} \qquad s^2_k(X) = \frac{n - n_k}{n - 1} \frac{s^2(X)}{n_k}$$

being $s^2(X)$ and $s^2_k(X)$ the variance of the variable X and the mean variance respectively, in the case of a variance without repetition of measurement as for n_k individuals considered.

For instance, if the null hypothesis is true, i.e. random extraction of n_k individuals, the mean arithmetic variable $\overline{X}_k$ is distributed like a standard normal variable with mean $\overline{X}$ and variance $s^2_k(X)$.

Clearly, this value-test, meant as a real probability test, can be associated with additional variables, i.e. those which did not contribute to determine groups. It can also be used to arrange active variables in a decreasing order, considered according to their power to characterise each group: high values in the test are associated with the most characterising variables.

In the case of qualitative or nominal variables, a value-test is calculated per each modality of the variable, which is considered as typical of a specific group if its frequency is much higher than it is in the population. Assuming the null hypothesis is true, i.e. n_k individuals are determined without repetition of measurement out of a population of individuals n, the percentage of individuals with a modality j in the group k coincides with the one observed in the population. Hence, the random variable N of individuals is distributed like a hypergeometric function, with the following parameters: n, n_k and n_j. Having calculated the probability $p_k(j)$ to obtain a N value which is higher than n_{jk}, if this value becomes smaller, the null hypothesis is rejected. Hence, the decreasing order of probability determines the rating of the most characterising modalities per each group.

As probability is often very low, the test $t_k(N)$ is also taken into account. It determines the significance of the difference between the modality frequency in the group and the

modality frequency in the population, in terms of standard deviation and normal distribution:

$t_k(N) = \frac{N - E(N)}{s_k(N)}$ where $E(N) = n_k \frac{n_j}{n}$ and

$s^2_k(N) = n_k \frac{n - n_k}{n - 1} \frac{n_j}{n} \left(1 - \frac{n_j}{n}\right)$

Of course, when it comes to interpreting the clustering outcomes, it is essential to consider that these are probabilistic measures. This means that measures allow us to identify the most characterising features within each cluster, but not all the features can necessarily be found in each individual of the group. In other words, clusters are described statistically, assessing the elements which are, most likely, peculiar in that group, but without claiming to find the same features in each individual of the cluster.

As it is shown in Tab. 4, for each of the 10 clusters and according to each satisfaction criterion, the value of the statistical test was normalised to 100 by the maximum value observed. The following figures are highlighted in the table:

1. the maximum and the minimum value of the statistical test;
2. above-average values are in italics, to distinguish them from below-average ones.

Tab. 4. Descriptors of the animals' key features

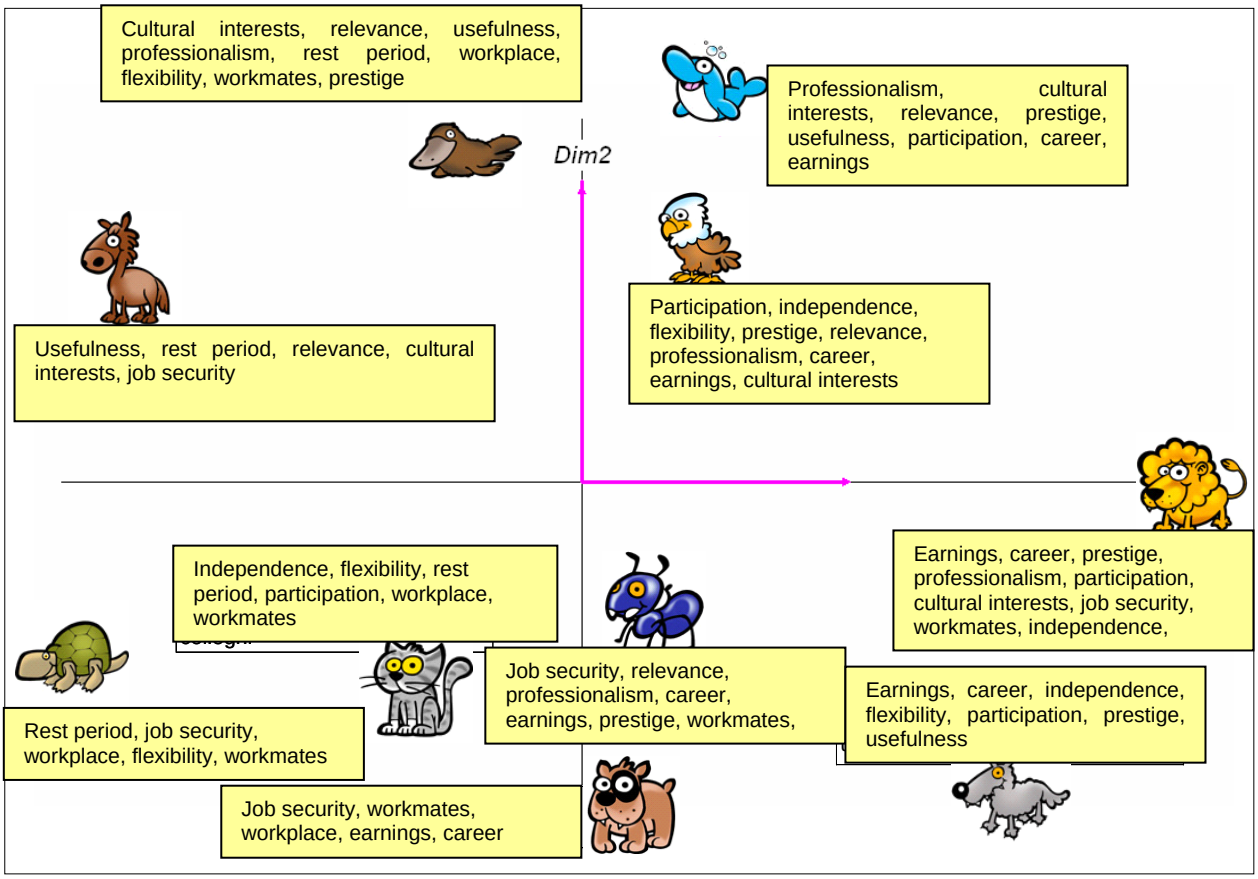
14 satisfaction criteria	Alpine eaglet	House wolf	Rampant lion	Mediter. dolphin	Ambitious ant	Platypus	Zorro's horse i	Sneaky cat	Watchdog	Garden tortoise
career	***23.0***	***99.6***	***98.8***	***27.4***	***22.4***	-48.9	-96.6	-50.8	***18.0***	-65.7
relevance	***34.2***	-54.5	***5.1***	***86.2***	***46.6***	***59.6***	***21.4***	-100.0	-70.3	-61.8
participation	***100.0***	***30.9***	***34.9***	***34.5***	-68.8	-19.0	-28.6	***60.0***	-7.7	-87.3
workmates	-90.0	-1.1	***19.0***	-28.3	***1.3***	***13.8***	-30.9	***32.3***	***54.8***	***14.2***
flexibility	***84.1***	***32.5***	-27.3	-100.0	-84.6	***20.5***	-6.1	***86.8***	-21.3	***19.3***
earnings	***22.0***	***100.0***	***100.0***	***4.7***	***20.9***	-56.5	-100.0	-34.5	***32.2***	-60.0
independence	***90.6***	***37.6***	***12.2***	-9.4	-100.0	-18.0	-14.8	***98.1***	-1.5	-47.8
Cultural interests	***21.8***	-9.4	***28.2***	***87.7***	***0.9***	***69.1***	***12.0***	-64.9	-83.9	-84.7
workplace	-79.6	-1.2	***10.3***	-43.9	-12.7	***23.6***	-23.1	***47.8***	***33.9***	***27.9***
prestige	***35.5***	***15.5***	***75.4***	***82.4***	***20.7***	***9.6***	-57.5	-56.2	-19.1	-99.9
professionalism	***24.2***	-19.7	***52.4***	***90.1***	***38.9***	***35.1***	-26.4	-82.5	-28.9	-98.5
Job security	-53.6	-38.5	***22.2***	-8.1	***94.8***	-100.0	***2.8***	-58.1	***92.2***	***53.8***
Rest period	-75.8	-2.6	-53.8	-94.2	-49.0	***34.6***	***51.0***	***67.5***	-7.2	***100.0***
usefulnes	-18.4	***14.7***	-11.3	***79.7***	-56.3	***50.6***	***63.1***	-4.0	-100.0	-19.8

For the purpose of conciseness and to outline the clusters' key features and their differences, a distance matrix of animals' groups is shown in Tab. 5. This kind of matrix can be described by means of algorithms that allow us to develop real positioning maps for each entry represented in the rows and columns of the matrix.

Tab. 5. Distance matrix showing the distance between animals' clusters

	Eaglet	Wolf	Lion	Dolphin	Ant	Platypus	Horse	Cat	Dog	Tortoise
Eaglet	0	3.996	7.892	3.698	6.404	5.563	10.289	4.672	6.415	14.301
Wolf	3.996	0	4.638	7.290	8.783	9.798	17.607	6.041	6.660	16.424
Lion	7.892	4.638	0	6.265	7.899	15.370	27.119	15.844	9.615	27.457
Dolphin	3.698	7.290	6.265	0	3.722	4.663	9.974	9.641	8.300	17.030
Ant	6.404	8.783	7.899	3.722	0	7.333	10.067	9.287	2.967	9.610
Platypus	5.563	9.798	15.370	4.663	7.333	0	4.374	5.415	10.163	10.693
Horse	10.289	17.607	27.119	9.974	10.067	4.374	0	6.414	11.457	5.350
Cat	4.672	6.041	15.844	9.641	9.287	5.415	6.414	0	4.682	5.639
Dog	6.415	6.660	9.615	8.300	2.967	10.163	11.457	4.682	0	6.218
Tortoise	14.301	16.424	27.457	17.030	9.610	10.693	5.350	5.639	6.218	0

As a result, a difference map was designed to provide a visual tool to assess differences and similarities between the 10 small animal icons by means of a multidimensional scaling procedure (MDS). The latter was developed only on 2 dimensions to allow easy and effective visualisation of differences and similarities among the 10 animals. As for similarities, they can also be observed in the dendrogram on the following page, which shows interrelations of the animals' group.



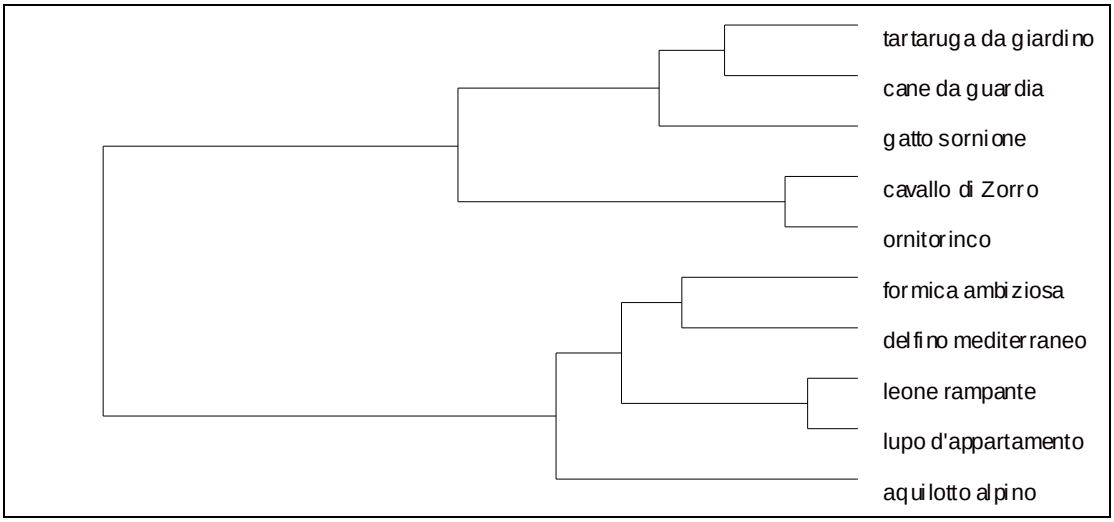


Fig. 6. Dendrogram showing similarities among the animals' key features.

Users express their preference for each of the 14 aspects of the kind of job that, as about-to-be university students, they would like to find after graduation. According to the answers given, each user determines a personal profile which is at a certain distance from each of the 10 standard animals identified through the survey on occupational conditions of graduates.

The distance determined by the system is a classical Euclidean distance, computed according to the space originated by the 14 answer items. This is then transformed into an orthogonal space determined by the latent dimensions of the cluster analysis mentioned above.

The outcome of this analysis is summed up in the final profile through an animated graph (Fig. 7). The user is depicted by an icon on the left-hand side of the graph, whereas the 10 standard profiles, each symbolised by an animal icon, are on the right-hand side at a distance which is proportional to the distance computed with respect to each standard profile. Small animals which are closer to the user icon identify professional profiles which are closer to his/her ambitions. It is worth mentioning that profiles sum up the average aspects, both more and less significant ones, on the sample analysed and, thus, an animal may not represent the user fully.

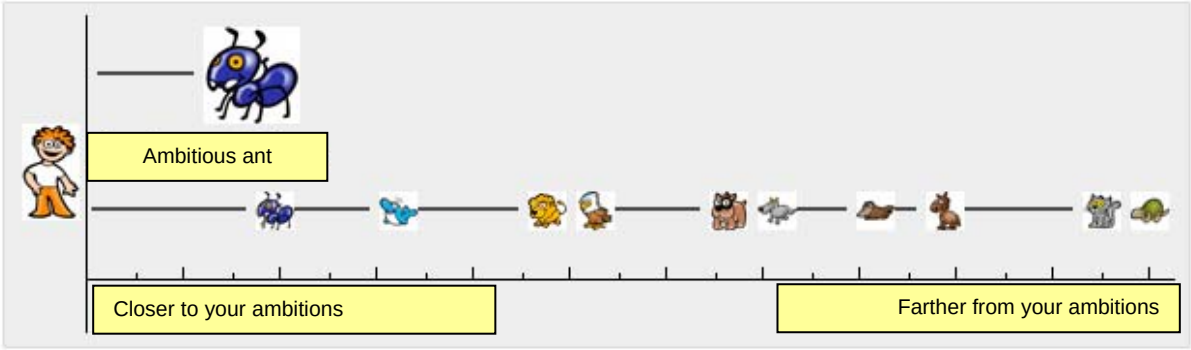


Fig. 7. Qualitative diagram showing the distance between the respondent and each of the 10 standard profiles ('animals').

Clicking on each small animal, the key features of each professional profile are shown in detail: thus, regardless of the outcome, each user may assess what is the professional career that better fits his/her ambitions in an independent and critical way.

Sample standard profile. The 'ambitious ant'

On the basis of the answers provided by currently employed graduates, what are the most satisfying aspects of their job, according to the 'ambitious ant' group? Certainly, their job security, the relevance of their job to their university studies, the opportunity to enhance their professionalism, the opportunity for better career and earnings, their professional prestige, their relation with workmates, the correspondence between their job and cultural interests.

However, ambitious ants are not satisfied with the opportunity to be autonomous and independent, to have flexible working hours, to participate in the decision-making process at firm level, the opportunity to do a job which is useful for the society as well as with the amount of rest time they receive and their workplace.

It is important to stress that the profile does not purport to recommend degree courses which may 'guarantee' the professional success of young people. As a matter of fact, some things should not be neglected. First, surveys are carried out on the degree-holders who graduated in 1999 and 2000 (i.e. pre-reform graduates), who completed succesfully their course of study at university and who declared themselves employed 5 years on from degree completion. Moreover, for the model to be predictive, it would be required to assume a substantial job security in the labour market over time.

Ambitious ants are, most probably, male. Their most likely courses of study fall into both the Economics and Statistics and Engineering groupings. As to the working sector they will most probably find a job in, this can be either the banking sector, the insurance sector, the engineering industry, the chemical sector, the manufacturing sector (production of small goods) or the IT sector. Moreover, they are most likely to find a job in the private sector. Their net monthly earnings 5 years after graduation are, most probably, above average and it takes them shorter time to find a job.

Starting from the degree courses which are most attended by the 'ambitious ant' student, it is possible to go back to the relevant degree course groupings, which are organised as follows:

Economics and Statistics: Economics and Business Economics; Economics Sciences; Statistics.

Engineering: Civil and Environmental Engineering; IT Engineering; Industrial Engineering.

Fig. 8 shows the average opinion of people who fell into the 'ambitious ant' category. A steady job is deemed fundamental by this group. They expect relevance of their job to their studies as well as professionalism development whereas aspects linked to personal freedom and independence are less important for them.

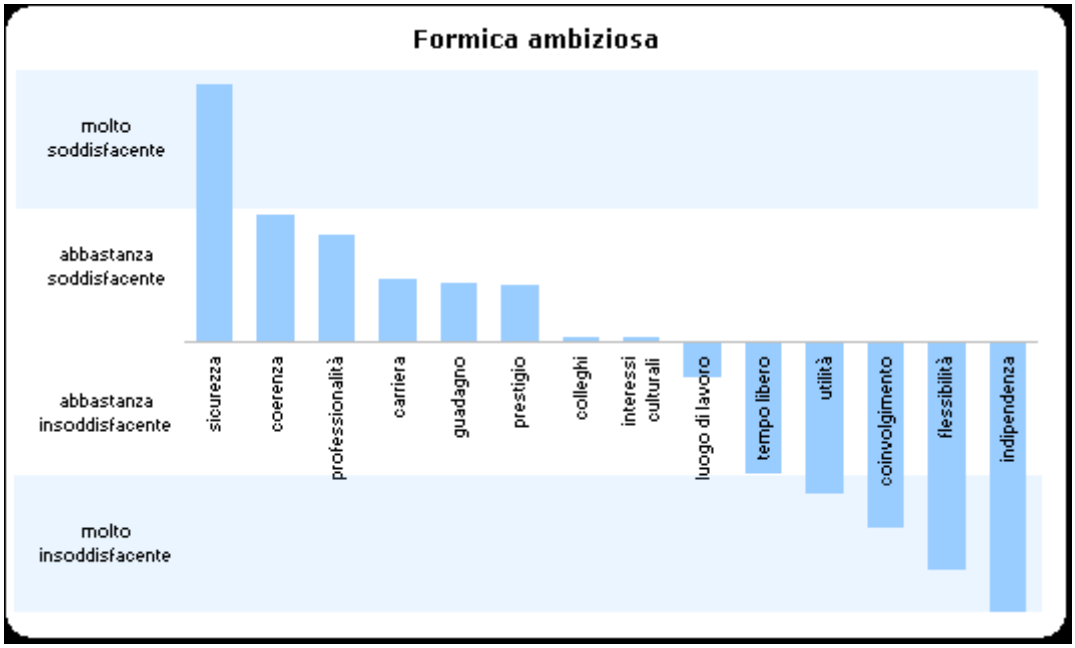


Fig. 8. Assessment of the job features for the 'ambitious ant' standard profile.

5. Tool promotion and usage statistics

The guidance track has been advertised through the following websites:

1. www.almalaurea.it. AlmaLaurea consortium website, more specifically in a section of the AlmaLaurea website devoted to university guidance.
2. www.almadiploma.it. Alma Diploma association website, a twin project of AlmaLaurea, which is devoted to Italian high schools.
3. www.repubblica.it. Website of 'La Repubblica', one of the 2 most popular Italian newspapers. About 2 million visitors browse La Repubblica website every day, giving a total of 16m web pages visited (source: audiweb data, as at March 2008) [9].

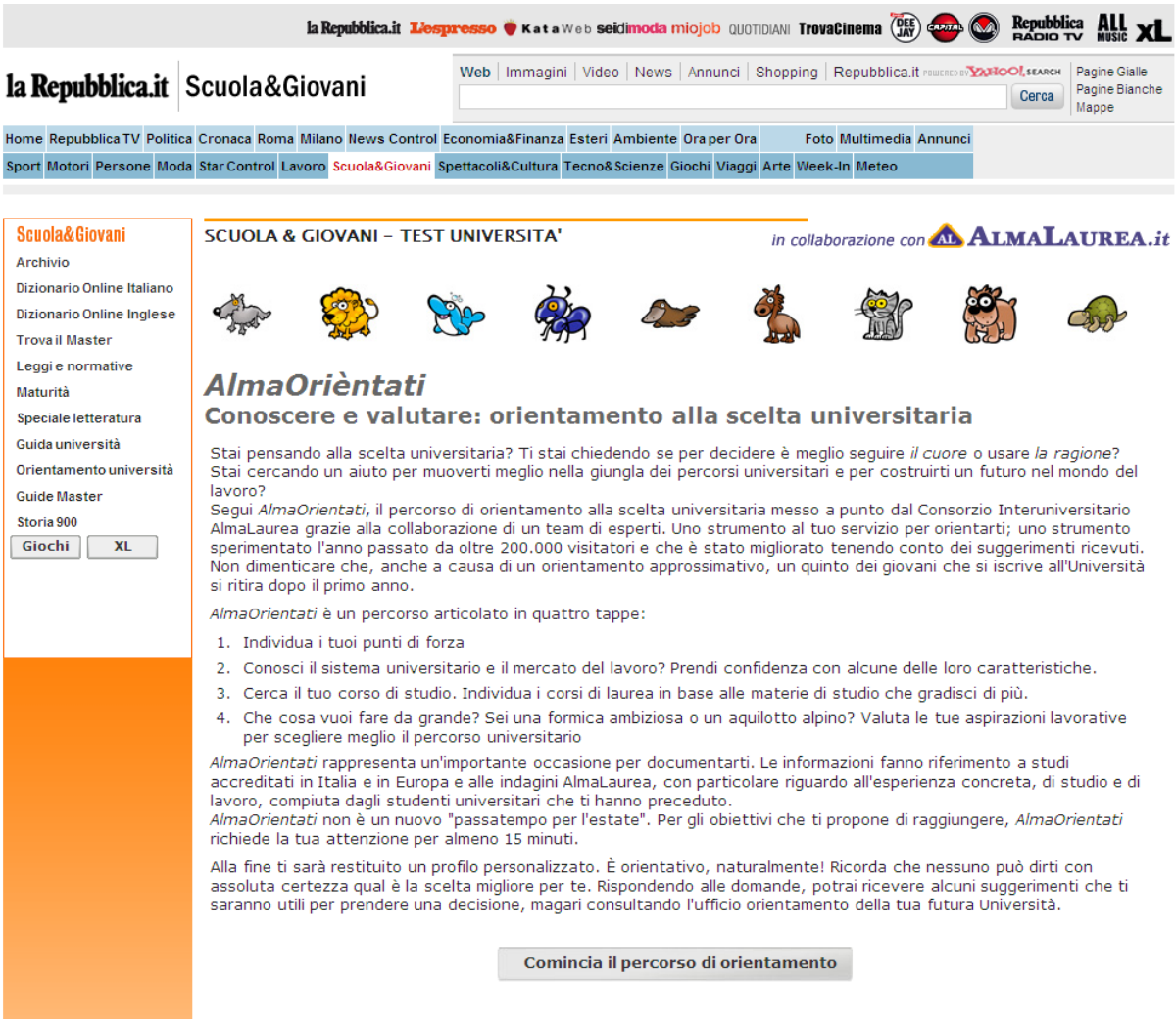


Fig. 9. The guidance track (first page) with the skin for the website www.repubblica.it

As it can be easily imagined, web traffic pertaining to the guidance track generated mainly through La Repubblica website. Moreover, it has been deeply conditioned by direct links to it on the newspaper's home page.

The guidance track can be viewed by clicking on 3 links, the first of which is on the home page. However, sometimes it could be accessed as a home page of its own, thus producing noticeable traffic peaks and a large number of visited web pages.

For instance, a daily average traffic of 1400 accesses was recorded in the month of June 2007 (qualitative trend of the wesite traffic is shown in fig. 8), with a peak of about 10,000 accesses on 8 June. The average number of pages visited in the same month is 15,000 with a peak of over 100,000 pages on 8 June. 33,000 accesses were recorded on 27 April with over 464,000 pages visited.

On the whole, the 2007 guidance track has recorded to date **314,000 accesses,** giving a total of **3.7 million of pages visited.** The total amount of completed questionnaires is equal to **101,000.** Moreover, the 2008 guidance track will be posted on the website within the month of May.

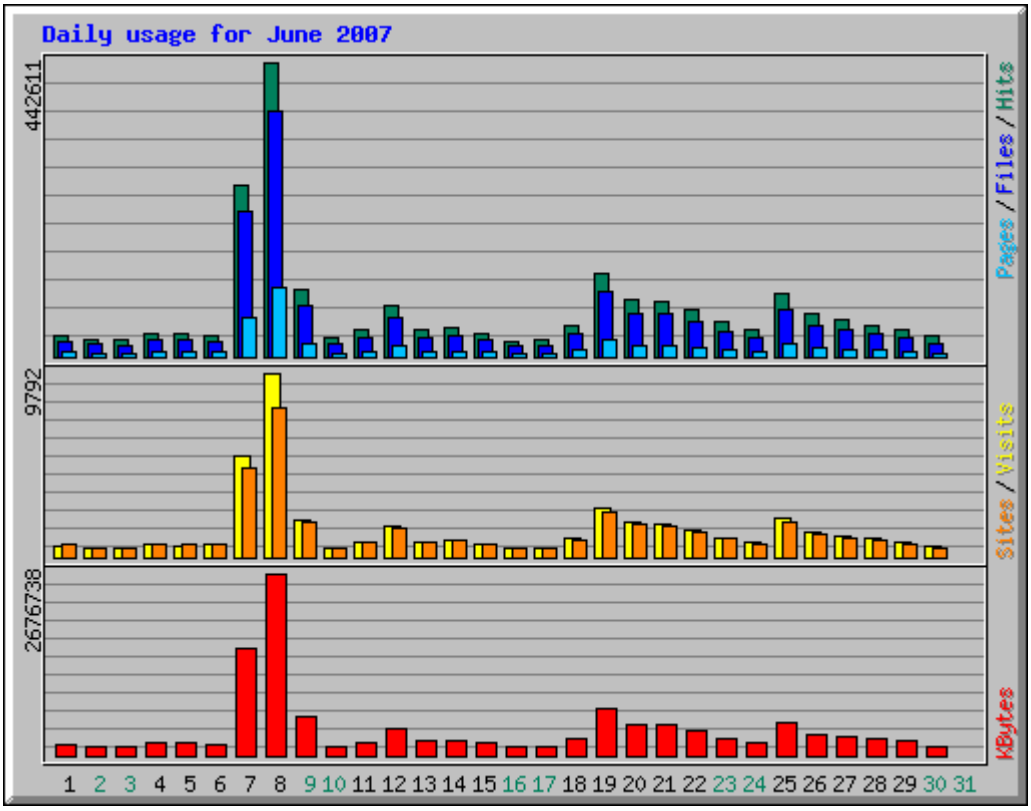


Fig. 10. Trend of the average daily website traffic pertaining to the guidance track in the month of June 2007.

6. Analysis of data collected – some useful remarks

The graph in Fig. 11 shows the opinions expressed by users in terms of viewing ratings as for the 29 subject areas within the guidance track. Notice that the left-right order here corresponds to the popularity rating by the respondents. However, the graphical indicator is determined by the specific non-linear change occurred in the preferences. It is quite interesting that Computer Science ranks first and is followed mainly by humanities, excluding Biology, Mathematics and Geology. As to the other side of the graph, it is also interesting to notice that the final two slots are occupied by Agriculture and Veterinary Medicine, i.e. the ones which are most typically connected with the agriculture sector.

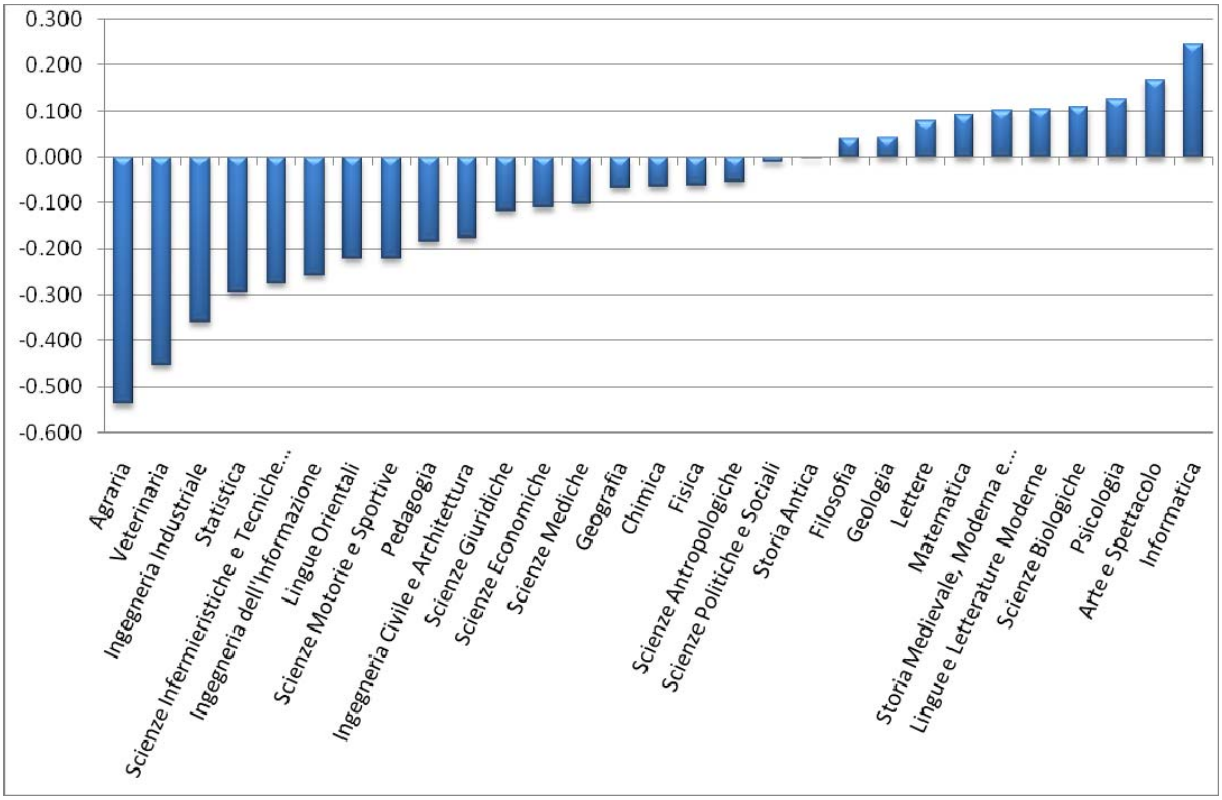


Fig. 11. Opinions expressed by users in terms of viewing ratings as for the 29 subject areas (translations in Tab. 6).

Tab. 6. Translations for Fig. 11.

Agrarian	Agriculture
Veterinaria	Veterinary Medicine
Ingegneria industriale	Industrial Engineering
Statistica	Statistics
Scienze Infermieristiche e Tecniche…	Nursing Sciences and Applied Medical Techniques
Ingegneria dell'informazione	IT Engineering
Lingue orientali	Oriental Languages
Scienze Motorie e Sportive	Movement and Sports Science
Pedagogia	Science of Education
Ingegneria Civile ed Architettura	Civil Engineering and Architecture
Scienze Giuridiche	Legal Science
Scienze Economiche	Economics Sciences
Scienze Mediche	Medical Sciences
Geografia	Geography
Chimica	Chemistry
Scienze antropologiche	Anthropological Science
Scienze politiche e sociali	Political and Social Sciences
Storia antica	Early History
Filosofia	Philosophy
Geologia	Geology
Lettere	Arts
Storia medievale, moderna e contemporanea	Medieval, Modern and Contemporary History

Lingue e letterature moderne	Modern Foreign Languages and Literature
Scienze biologiche	Biology
Psicologia	Psychology
Arte e spettacolo	Performing Arts
Infomatica	Computer Science

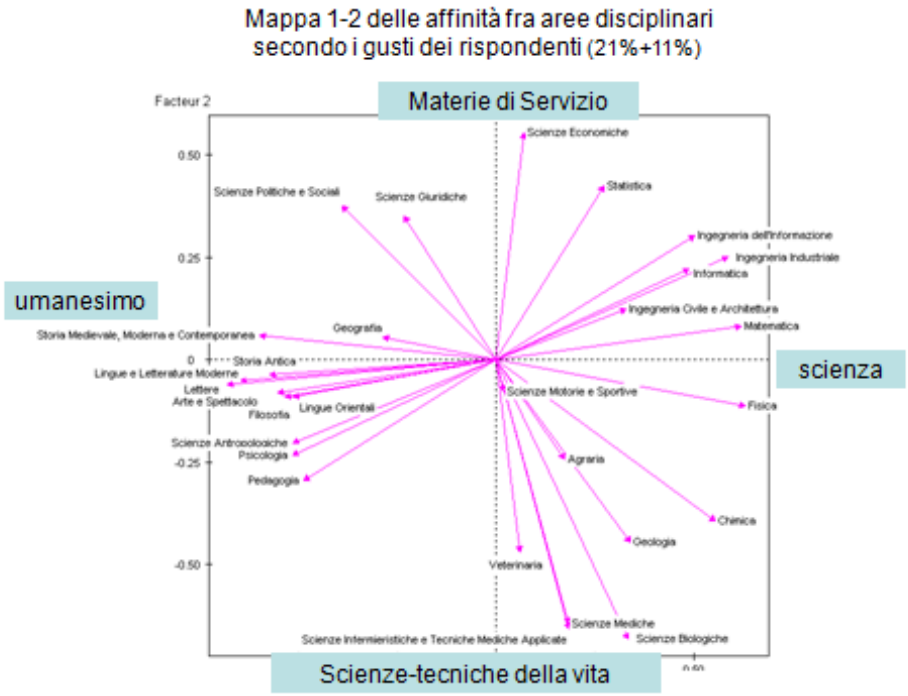


Fig. 12. Factorial map showing correlations betweens respondents' preferences.

As to the first 2 dimensions, the factorial map in Fig. 12 shows how correlations between respondents' preferences are self-combined with regard to the subjects listed in the questionnaire.

The horizontal dimension, the main one, shows the usual dichotomy between humanities and science (the benchmark being represented by Arts-history and Mathematics-Physics respectively, Fig. 13). On the other hand, the second dimension shows the separation between technical-social subjects and Human and Life Sciences (Fig. 14).

This proves that respondents' ideas are characterised by usual semantic contrasts which suggest a kind of traditional self-assessment of subjects and is mirrored in the pattern of preference.

Another study dealt with the connections of opinions on subjects and other information collected thanks to the questionnaire. It showed a high level of connotation of the 4 semantic areas, which are defined by the most external cardinal points on the map.

Connotations are briefly outlined and shown in the following graphs according to the two dimensions.

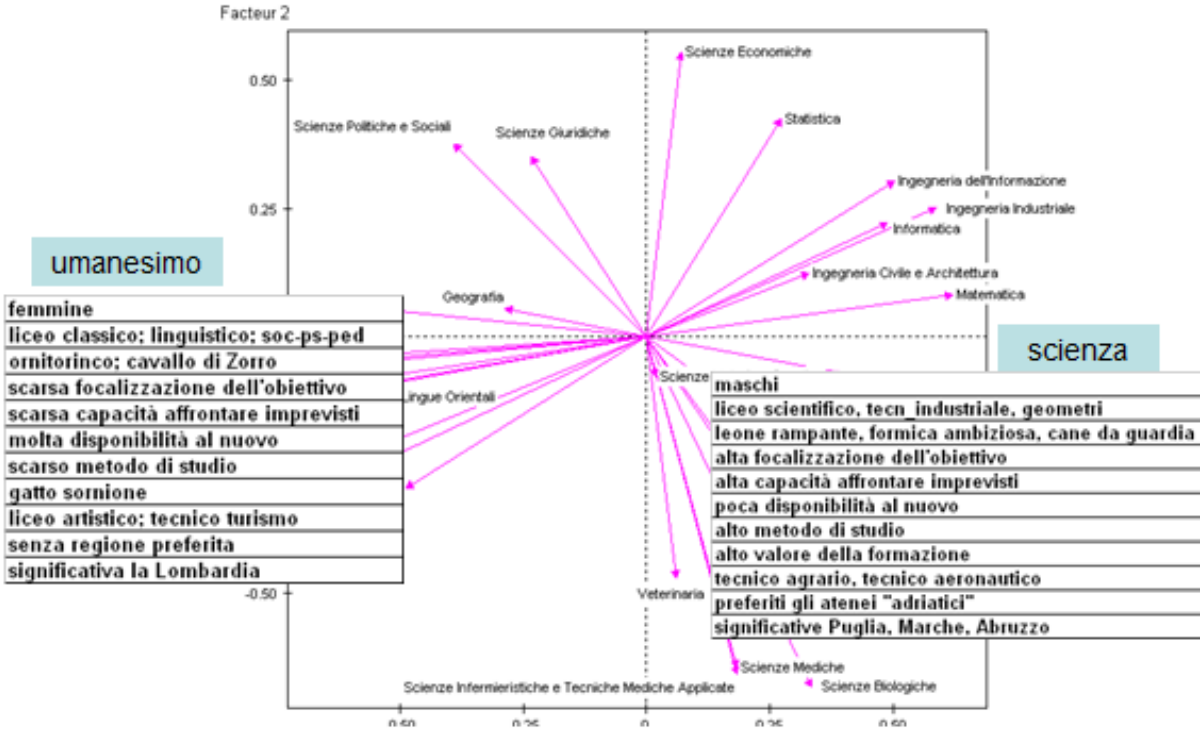


Fig. 13. Dichotomy between humanities (left) and science (right). See translations below.

UMANITY	SCIENCE
Female students	Male students
High schools specialising in: classical studies, modern languages; social-psychological studies	High schools specialising in: science subjects; technical-industrial studies; building-surveying studies
Platypus; Zorro's horse	Rampant lion, ambitious ant, watchdog
Lacking focalisation on the target	Significant focalisation on the target
Lacking ability to cope with the unexpected	Significant ability to cope with the unexpected
Lacking open-mindedness	Significant open-mindedness
Lacking studying method	effective studying method
Sneaky cat	High value of education
High schools specialising in: figurative arts; tourism studies	High schools specialising in: agriculture studies and techniques; aeronautics.
Without a favourite region	Preferred universities: those located along the Adriatic coast
Most significant region: Lombardy	Most significant regions: Puglia, Marche and Abruzzo

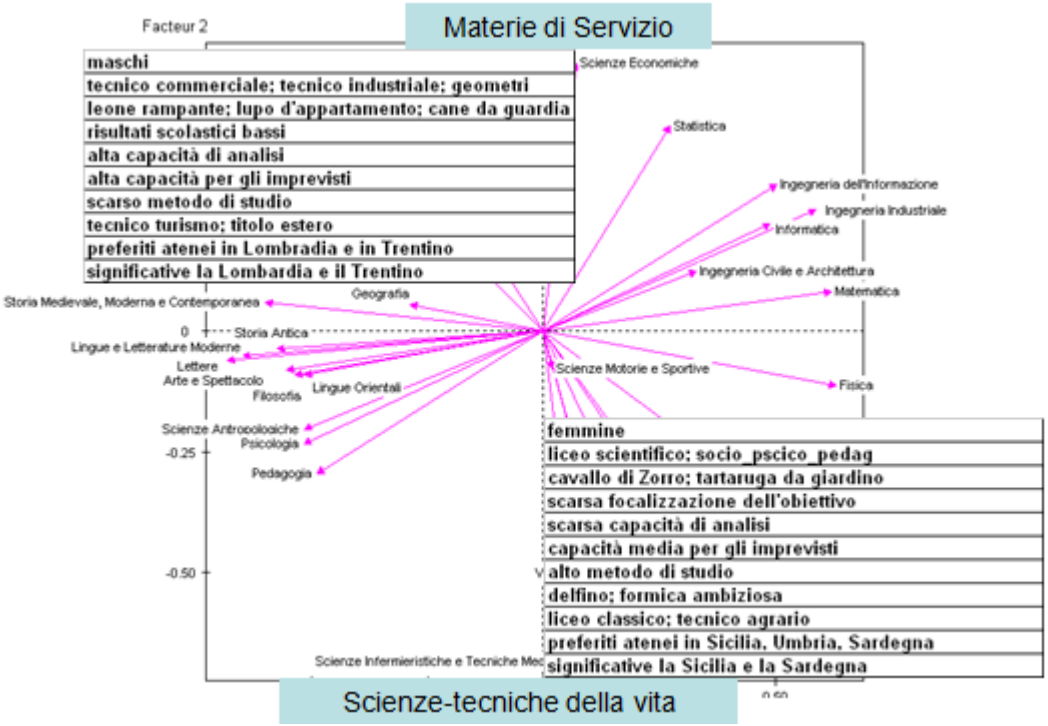


Fig. 14. Separation between technical-social subjects (bottom) and Human and Life Sciences (top). See translations below.

technical-social	Human and Life Sciences
Male students	Female students
High schools specialising in: technical-marketing subjects; technical-industrial studies; building-surveying studies	High schools specialising in: science subjects; social-psychological studies
Rampant lion, house wolf, watchdog	Zorro's horse; garden tortoise
Poor school outcomes	Lacking focalisation on the target
Significant analytical capacity	Poor analytical capacity
Significant ability to cope with the unexpected	average capacity to cope with the unexpected
Lacking studying method	Effective studying method
High schools specialising in: tourism studies. Foreign school-leaving certificate	Dolphin, ambitious ant
Preferred universities: in Lombardy and Trentino Alto Adige	High schools specialising in: classical studies; agriculture studies and techniques.
Most significant regions: Lombardy and Trentino Alto Adige	Preferred universities: in Umbria, Sicily and Sardinia
	Most significant regions: Sicily and Sardinia

6.1. Conclusions

Higher education guidance is a key controversial issue in Italy, where almost 20% of young university students drop out after only a year at university. The degree choice is one of the most important decisions people are faced with, maybe the first important decision in their life. The solution we are suggesting is not meant to substitute any other tool. Still, it can be used along with the existing ones as well. It has the advantage of pushing users to consider carefully their ambitions, capacities and passions. Last but not least, it is a spur to deepen their knowledge of the university system which is too often taken for granted. The University system and the labour market are ever changing and

they have changed dramatically from the ones that their parents experienced. Hence, getting informed before making a decision becomes important, or rather fundamental.

7. REFERENCES

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