



Combining technical and business studies at the Universidad Politécnica de Madrid: Analysis of the Double Degree student profile

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HIGHLIGHTS

- Double Degrees play an important role in the current landscape of higher education.
- UPM Double Degrees combining technical and business disciplines are still at an early stage.
- Academic contents are biased towards technical disciplines rather than business.
- Students prefer technical modules, but value business contents for employability.

ABSTRACT

Double degrees have emerged as an attractive alternative for Spanish university students. The Double Degree in Building and in Business Administration and Management (EDIF-ADE) was a pioneer among the Double Degrees implemented at the Universidad Politécnica de Madrid (UPM) and is currently experiencing a great demand. This study analyses the profile of EDIF-ADE students to understand the keys to this success. Through a survey of first-, second-, third-, and fourth-year students, we examined (1) students' prior knowledge; (2) motivations and interest areas; (3) educational and occupational expectations; (4) results and knowledge acquired. The results of the study reveal that, although most of the students had no prior knowledge of economics and business, they consider this training as an important element in their future professional development that enhances their employability prospects.

Keywords: *Double Degree, Building, Business Administration and Management, interest, students.*

1. INTRODUCTION

Double degrees have emerged as attractive alternatives for Spanish university students [1]. The number and types of double degrees in Spanish and European universities has multiplied almost fourfold in the last six years, which shows that they clearly play a relevant role in the European Higher Education Area [2,3]. Spanish universities offer a wide variety of double degrees, including very different combinations, from degrees in similar knowledge areas (e.g., the traditional Double Degree in Business Administration and Management and in Law or the recently created Double Degree in Physics and Mathematics) to others in more distant but apparently complementary areas, as in the case of double degrees combining technical and social studies [3].

In the latter case, the Universidad Politécnica de Madrid (UPM) has recently launched several double degrees that combine the traditional degrees of the UPM's academic catalogue with Business Administration and Management (BAM). These are the Double Degree in Building and Business Administration and Management, Double Degree in Civil and Territorial Engineering and Business Administration and Management, and Double Degree in Computing

and Business Administration and Management [4]. These double degrees benefit from professors from different schools and therefore provide opportunities for collaboration and cross-fertilisation among university staff.

The UPM has traditionally incorporated business administration competences in its curricula. However, the implementation of these double degrees entails an additional step that increases the duration of the degrees from four to five years. It is expected that graduates of the double degrees will acquire the specific competences of the business administration degrees in addition to the transversal and technical competences of the traditional UPM degrees.

Thus, this conception represents a radical change with respect to the traditional situation of the UPM graduate. In many cases, UPM graduates had access to management-oriented positions after an extensive technical background and, not infrequently, after specialised postgraduate studies in the field of business management (Master of Business Administration or similar) [5, 6, 7]. To a certain extent, the implementation of double degrees tries to satisfy these additional training needs of UPM graduates.

In addition, double degrees can revalue degrees that at first have no optimal employment opportunities as they complement them with a practical education oriented to results. This could suggest that new doors of action in fields directly related to business administration are opening for UPM double degree graduates.

Particularly interesting in this regard is how companies perceive these qualifications or whether they match their needs (an interesting study related to this issue can be found in [8]). By developing skills in at least two disciplines, and learning to switch between them, these students may be better able to adapt their skills and knowledge to new contexts in a flexible and responsive way [9].

There is also a relevant aspect of the implementation of these double degrees that has to do with the student body. In general, it can be assumed that taking a double degree implies an additional effort for students. Double degrees last longer than their single degree peers and, although the total number of ECTS (European Credit Transfer and Accumulation System) taken is reduced compared to the two separate degrees, the annual ECTS load is also generally higher than that of any single degree [2]. Besides, it is worth noting that there may be additional complications arising from the diverse nature of the many subjects that students must deal with daily. Combining, for example, legal subjects with other subjects related to structural calculations could be an additional challenge for certain students with very specific skills.

In this context, it makes sense to analyse the content and competences linked to this type of double degrees and, in particular, to the Double Degree in Building, Business Administration and Management (EDIF-ADE), the first to be implemented at the UPM.

The success and student perception of this double degree (EDIF-ADE) has not been studied

yet. This situation leads us directly to consider the characteristics of the EDIF-ADE students and to analyse students' prior knowledge, the training received, and their perception of the training received. A priori, one might think that the typical student of these degrees would be a traditional UPM student seeking to complete and complement his or her training with transversal issues. However, other students with different expectations and qualifications can also gain access, bringing different relevant profiles and perspectives.

Thus, this paper aims to analyse the characteristics of the Double Degree in Building, Business Administration and Management (EDFI-ADE) at the UPM in the context of both degrees, as well as to analyse the characteristics, expectations and results of the students taking this double degree programme.

2. METHODOLOGY

To achieve the paper's objective, work has been carried out in two directions:

Firstly, the academic characteristics of the EDIF-ADE Double Degree have been studied independently and in relation to the same degree in other Spanish universities. A comparative analysis of the two degrees in isolation has also been performed.

Secondly, EDIF-ADE students were asked about their expectations, prior knowledge, and results to deepen their experiences and perceptions. To this end, a survey was carried out among students in the first, second, third and fourth years of the double degree. The survey was conducted in the second semester of the 2019/2020. This made it difficult to reach fifth-year students, mainly because they have less teaching load in this part of the academic year. The students are carrying out the two final degree

projects in Building, and in Business Administration and Management and they have only few classes. For this reason, and for logistical reasons, the survey was not carried out among fifth-year students.

The survey was built in Google Forms and distributed in class through a web platform (Moodle) in the virtual spaces of different subjects.

In the survey questionnaire, students were asked to respond anonymously and voluntarily to different questions, most of them closed-ended questions, including common types of multiple choice, dichotomous (yes/no), semantic differential scales (a lot/somewhat/not at all), matrix checkbox, and Likert agree/disagree scales. In all cases, students were given the opportunity to select the option 'don't know/no answer'.

The questionnaire was structured around 18 questions. The first two questions were introductory questions. Students were asked about the year of admission to the double degree and the course (or courses) they were currently enrolled in. The remaining 15 questions were structured in four major blocks as follows:

- Block 1. Prior-knowledge assessment. This block analyses the training received in secondary education and the admission process for the double degree, in particular, the university entrance mark and the year of admission.
- Block 2. Students' motivation and interest in the double degree. This block includes questions related to the choice of the double degree in undergraduate applications and the reasons for wanting to study the double degree.
- Block 3. Students' interest in economics and business and the educational and

occupational expectations for the future. This block assesses whether students regularly follow the financial press and whether they are considering taking a postgraduate degree in economics and/or business administration. In addition, students were asked to indicate what kind of work they would like to do when they finish their degree (focused on Building, Business Administration and Management, both, or something different).

- Block 4. Evaluation of the results and knowledge gained. This block has two parts. The first part reviews in which subjects students are getting the highest marks and analyses whether students' knowledge of economics and business administration has improved after studying the double degree. In the second part, basic financial knowledge is measured using the Standard & Poor's Ratings Services Global Financial Literacy Survey, which is the world's largest, most comprehensive global measurement of financial literacy [10]. The five-question test probes knowledge of four basic financial concepts: risk diversification, inflation, numeracy, and interest compounding. To pass, students must answer three out of five questions correctly. These questions seek to put into context the knowledge gained by students in economics and finance.

In general, the survey questions focus on revealing the interest of the students of the Double Degree EDIF-ADE in economics and business administration. This was based on the assumption that students, when enrolling for a university degree at the UPM, want to be, above all, engineers, but they value acquiring job-relevant skills related to management, consultancy, and evaluation in business organisations. Thus, they value the improvement of their employment prospects by obtaining a double degree.

3. RESULTS AND DISCUSSION

3.1 Academic structure of the Double Degree

The double degree EDIF-ADE has 399 ECTS divided into 5 academic years. This requires a dedication of around 80 ECTS per year, higher than the workload of an academic year in a single degree, which is normally set at 60 ECTS. Besides, each degree (Building and Business Administration and Management) has 240 ECTS and a duration of four years. This means that the double degree programme involves sharing subjects equivalent to 81 ECTS. The existence of potentially common subjects justifies this figure (81 ECTS). However, it is worth noting that in distant disciplines or areas of knowledge, finding such a number of common subjects could be complex.

The syllabus of the Degree in Business Administration and Management includes 30 ECTS of basic training in subjects common to those of the Degree in Building. In addition, this syllabus includes four specific mentions, one of them in Management and Administration of Building Companies, which includes a total of 51 ECTS of subjects compatible with the area of knowledge of building. Of these 51 credits, 45 correspond to specific compulsory subjects of the building curriculum, and 6 relate to optional subjects that complete the *acquis* in areas of building and business administration and management. The distribution of subjects by type and year is shown in table 1.

As can be seen in table 1, the distribution of ECTS enables the basic and specific compulsory subjects of the Degree in Business Administration and Management to be covered. Thus, the graduate in Business Administration and Management at the UPM acquires all the general and specific competences expected of

such a degree, together with a specialisation in the field of the Building Company. It is therefore expected that this double degree will enable students to obtain a set of competences from both technical and social science fields, which will provide them with a unique and highly attractive profile that will contribute to enhancing their professional prospects.

Course	ECTS basic training ¹	ECTS specific to Business Admin. Degree	ECTS specific to Building Degree ²	ECTS elective ³	TOTAL
1 ^o	72 (24/24/24)	0	3	0	75
2 ^o	18 (6/6/6)	24	36	0	78
3 ^o	0	27	54 (3)	0	81
4 ^o	0	36	39 (27)	0	75
5 ^o	0	30	54 (15)	6	90
Total	90 (30/30/30)	117	186	6	399

1. Numbers in brackets indicate the basic training ECTS in the following order: common to both bachelors' degrees / Business Admin. Degree basic training/ Building Degree basic training.

2. ECTS specific to Building Degree include 45 ECTS that correspond to the mention on Direction and Management of Building Companies of the Business Admin. Degree of UPM. Those 45 credits are included in brackets in the third, fourth and fifth course.

3. Credits of elective courses common to both Building and Business Admin. Degrees.

Table 1: Distribution of ECTS by courses and type of ECTS.

However, as stated by [1], it should be borne in mind that double degrees involve a higher number of ECTS credits per year than their single degree peers and that the subjects of these double degrees tend to generate an increased workload for students.

3.2 Students' opinions

The questionnaire was answered by 65 students. Most of the respondents started their double

degree studies in the academic year 2019-2020 (38.1%) and 2018-2019 (33.3%), so they are currently enrolled in the second and third year of the degree respectively. 12.7% of the respondents said they had started their studies in the academic year 2017-2018 and 9.5% in 2016-2017, so these students would theoretically be enrolled in fourth and fifth grade classes, respectively. Students who started their studies in the current academic year 2020-2021 represent only 6.4% of the sample.

Only 34.4% of students are enrolled in a single course (first, second, third or fourth year). The majority, 65.6%, are enrolled in more than one course (they have several subjects pending). In the latter case, 74% are enrolled in two courses and the remaining 36% are enrolled in three or more courses (two students said they are currently enrolled in four courses at the same time). This high percentage of students enrolled in more than two courses could be indicative of the difficulty for students to take a double degree with a high course load (a minimum of 75 ECTS per academic year).

The second year is the one with the highest number of enrolments among the respondents, followed by the third, first, fourth and fifth years. There are two reasons for this. Firstly, most of the respondents enrolled in the double degree in the academic years 2019-2020 and 2018-2019, so they should currently be enrolled in the second and third years. And secondly, the admission quota increased from 50 to 75 places in the academic year 2018-2019. This has led to more students enrolling in the first years than in the last years. Moreover, in all degrees, the first years tend to accumulate a higher number of students because more subjects are pending.

3.2.1 Previous knowledge

This block assesses the training received in the secondary education ('high school') (Figure 1) and the admission process to the double degree,

in particular, the university entrance mark (Figure 2) and the date of admission.

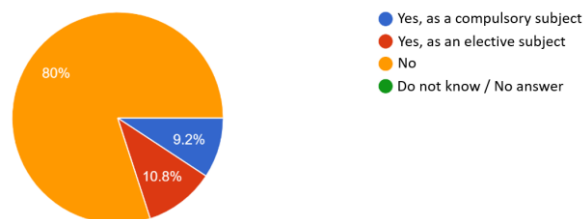


Fig. 1: Economics and Business studies in High School.

Figure 1 shows that 80% of the students did not take any subjects related to economics and/or business administration in high school. Only 20% studied economics and/or business administration, half of them as a compulsory subject and the other half as an optional subject. This indicates that most of the students who enter the double degree do so with a technical background (mainly in science) and without having received formal education in economics and business administration.

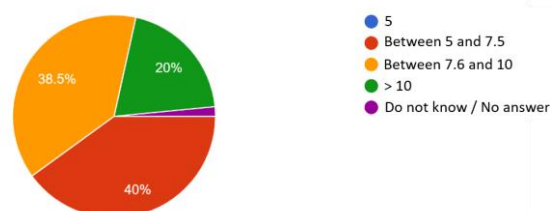


Fig. 2: University entrance mark.

In terms of university entrance marks (Figure 2), 40% of the students entered with a score between 5 and 7.5. 38.5% had an entrance mark between 7.6 and 10, and only 20% were above 10. This means that almost 60% of the students entered the double degree with a good academic record, clearly above the cut-off mark of recent years. In addition, the results obtained indicate that 80% of the respondents entered the double degree in June. Only 20% enrolled in September.

This seems to be in line with the literature. The general perception of double degrees is that only the best students get access to them because they require more time and effort [11]. In the case of the Double Degree EDIF-ADE, the entry mark has ranged between 5.0 and 5.3 in recent years (5.95 in previous years), so it could be said that it is not demanding in terms of the cut-off mark (at least in other double degrees the cut-off mark is much higher).

In the monitoring report for the 2016-2017 academic year [12] (the only published report at the moment), the teachers indicate that the access mark is too low and propose improving the selection of students who access the degree. In general, the teachers note little effort on the part of students and propose to better inform them of the difficulty and hard work involved in doing a double degree.

Our study shows that many students enter the Double Degree EDIF-ADE with a good academic record (scores above the cut-off mark), so it should be investigated whether the problem is rather a lack of basic knowledge in key areas. The limited background of students in economics and business administration could explain, in part, the problems detected in the basic subjects of Introduction to Business Administration and Principles of Economics. Other studies, such as that of Yue and Fu [13], go further and raise the question of to what extent is good to encourage successful students to pursue more majors and specialisations, and thus lengthen their time to graduation.

3.2.2 Interest and motivation for taking a double degree

This section presents the answers to questions included in Block 2. Figure 3 depicts the position the students applied for the double degree during their admission process.

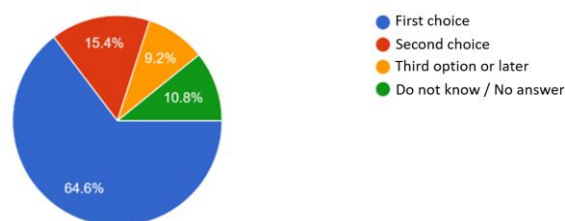


Fig. 3: Order of priority of the Double Degree in the application for access to the University

The results show that most of the students (64.4%) choose double degree as first choice while 15.4% and 9.2% selected it as either second or third alternative. It is worth noting that 24.6% did not select the double degree as the preferred option and that 9.6% answered not known/no answer. One student reported he had picked the double degree in tenth position. These results are in line with those presented in other studies [14,15]. However, one should bear in mind that students may not be sufficiently prepared when choosing their academic degrees [16].

As first option, Architecture was the most demanded degree, followed by both Economics and Business degrees. Other applied degrees were Accounting and finances, Materials engineering, Aerospace engineering, Business and administration, Law or Games design and development, Industrial or Mechanics engineering. Some who ticked the option not known/no answer reported they were target health-related disciplines. Following the 2016/2017 EDIF-ADE academic report [12], 90% of the students selected the double degree as first option, figure higher than that deduced from our survey. Furthermore, covering rate (admissions over total available places) was high and with increasing tendency: 86% for 2015/2016 and 92% for 2016/2017.

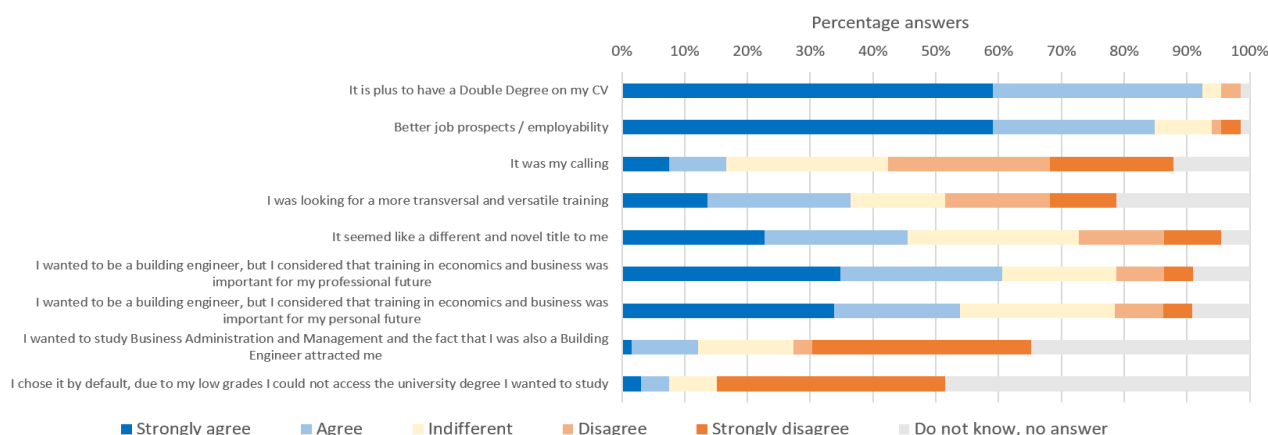


Fig. 4: Reasons why students decide to study the Double Degree.

Figure 4 presents the reasons the students argued to explain why they chose the double degree.

As it can be seen in figure 4, the main reason was to have a double degree on the Curriculum Vitae (CV): 60% strongly agreed and 34% agreed, while only 3%, 1% and 2%, was indifferent, had no opinion or disagreed, respectively. Achieving better job prospects also determined the selected alternative. Again 60% strongly agreed, and 26% agreed, with a much smaller share of responses that were indifferent to this reason (8%), had no opinion (2%) or either disagreed (2%) or strongly disagreed (2%).

The vocation for the double degree does not seem to be the most relevant factor leading the potential students select the double degree. 26% of the respondents disagreed and 20% strongly disagreed with this statement, while 25% were indifferent and 12% had no opinion. Only 8% and 9% agreed and strongly agreed, respectively.

Achieving a more transversal and versatile training received different valuations. 14% of the respondents showed strong agreement, 22% agreement, 17% disagreement, 11% strong disagreement, 15% were indifferent and 22% had no opinion.

It looked a different and novel degree also showed varied results. 23% either strongly agreed or agreed with this statement, 14% and 9% disagreed or strongly disagreed, while 25% were indifferent and 5% had no opinion.

Most of the respondents agreed that wanted to be building engineer but having business skills would be of interest for their future professional career. 35% strongly agreed and 25% agreed with that statement, 25% and 18% disagreed or strongly disagreed, while 8% were indifferent and 5% had no opinion. The same statement but based on personal reasons achieved similar results: 34% strongly agreed, 20% agreed, 25% were indifferent, 9% had no opinion, 6% disagreed and 5% strongly disagreed.

Pursuing a business and administration bachelor but partially attracted by building engineering does not seem to be a strong reason. 35% of the respondents strongly disagreed, 2% disagreed, 2% agreed, and 11% strongly agreed, 15% were indifferent, and 35% had no opinion. Students showing agreement with this statement are those who chose Economics or the Double Degree in Business and Administration Management and Computer science as their first-choice option, studied economics at high school and occasionally read the financial press.

Finally, students noticing the double degree was their last alternative only in the event of not achieving qualifications for the preferred degree does not seem to be a relevant reason. 35% of the respondents strongly disagreed with this statement, 3% agreed, 5% strongly agreed, 8% were indifferent, and 49% had no opinion.

In summary, students chose EDIF-ADE mostly because of the added value the double degree represent and the better professional expectations it offers. This finding is aligned with other studies revealing that flexibility, persistence and adaptation capacity of double degree's students are highly valued by employers [2,9]. However, not every double degree is equally perceived. Those combining engineering and business disciplines offer better expectations. In particular, salaries perceived by double graduates on business and engineering can exceed 50% over graduated individually on either business or engineering matters [18].

Our study also confirms that those who selected the double degree mainly wanted to be engineers, but they consider business to be important for their professional future. Others, such as Simon [19], found similar evidence. In Simon's study, the respondents recognize that economic subjects are more important than technical subjects.

3.2.3 Students' interests in economy and future perspectives

This section presents the answers to the questions included in Block 3.

Figure 5 displays the trends related to the attention paid by respondents to economy-specialised press-media (TV, radio, journals, internet).

The results show that 53.8% of students follow the economic news occasionally, 18.5% do it few

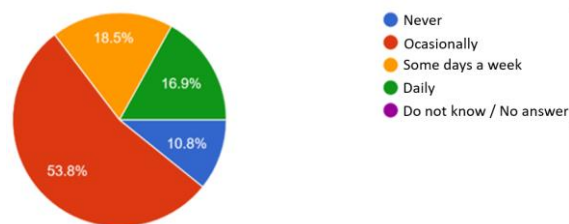


Fig. 5: Regular reading of economic information and news.

days per week, 16.9% daily and 10.8% never. Therefore, it seems that the students show interest in economics and frequently read the economic media.

Figure 6 summarise students' perspectives on taking further training in economy in the form of a master's degree. Most of the respondents showed no interest (50.8%), only 20% answered yes and 29.2% did not answer, which means that they are not particularly willing to pursue a master's degree in economics.

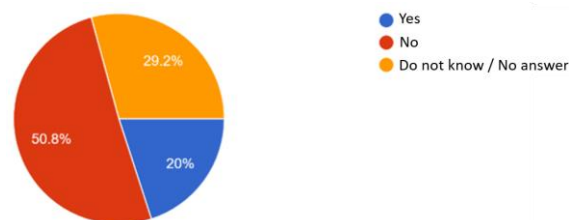


Fig. 6: Prospects of pursuing a postgraduate degree in Economics and / or Business Administration.

Regarding the type of job that the students would like to do at the end of their degree, the results show (see figure 7) that they would like to combine both disciplines, building and business administration (52,3% of the students chose this answer). 29.9% said they would prefer a job related to building and only 4.6 % a job related to business administration. A small percentage

(6.2%) would like to get a different work while 7.7% don't know/no answer.



Fig. 7: Type of job that students would like to do at the end of their degree

3.2.4 Perspectives on achieved results and developed skills

This section shows the results of the questions related to block 4 of the survey.

Figure 8 shows in which subjects students are receiving good marks.



Fig. 8: Subjects in which you are obtaining higher grades

Students achieved better results in business-related courses (44.6% chose this option) or similarly in both building and business-related courses (43.1%). Only 10.8% recognised was receiving better qualifications in building-related courses and 1.5% did not know/did not answer. Such findings coincide with those presented in the EDIF-ADE academic Report [12] that evidences better results of business-related courses.

In addition, Figure 9 reveals that the students have improved their knowledge of economics and business when studying business and

administration subjects in EDIF-ADE (77% agreed with this statement). 15.4% achieved more knowledge than expected, 29.2% said they matched expectations, 32.3% less than expected, 20% only slightly better than expected, and 1.5% did not know/did not answer.

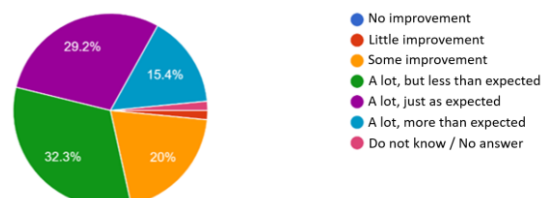


Fig. 9: To what extent their knowledge in economics and business has improved when studying business administration subjects

Finally, figures 10, 11, 12, 13 and 14 show the results of questions seeking to evaluate the students' basic knowledge on finance.

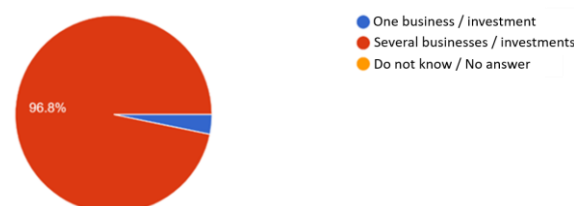


Fig. 10: Suppose you have some money. Is it safer to put it in a single business/investment or in several businesses/investments?

From figure 10 it can be observed that most the respondents answered correctly. 96.8% selected the option several business/investments.

Students also responded questions 11 and 12 correctly. 83.2% and 87.7% answered "The same" and "100 US dollars + 3%" in questions 11 and 12, respectively. 9.2% answered the questions wrongly and 4.6% and 3.1% replied don't know/no answer.

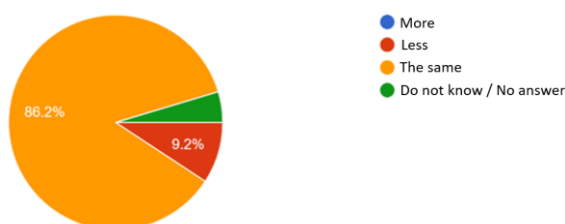


Fig. 11: Imagine that in the next 10 years the prices of the things you usually buy double. If your income level also doubles, how much can you buy?

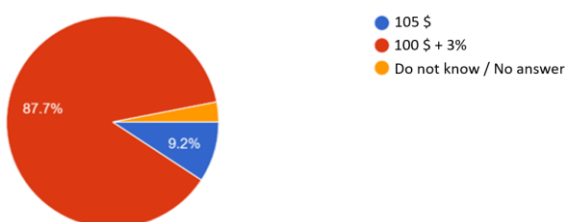


Fig. 12: Suppose you need to borrow 100 US dollars. Which is the lower amount to pay back: 105 US dollars or 100 US dollars plus three percent?

From figure 13 it can be observed that respondents did not respond so well. 58.5% selected the correct option (more money will be added during the second year), 29.3% answered incorrectly and 12.3% did not know/did not answer.

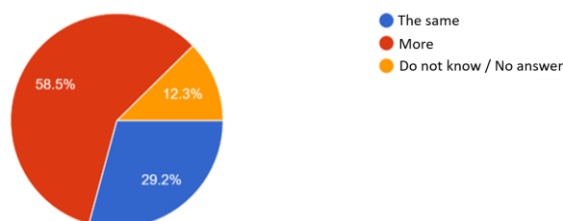


Fig. 13: Suppose you put money in the bank for two years and the bank agrees to add 15 percent per year to your account. Will the bank add more money to your account the second year than it did the first year, or will it add the same amount of money both years?

Most of the students also responded question 14 correctly. Results show that 64.6% selected the correct option (more than 150 dollars). However, the large number of incorrect answers is striking.

30.8% and 4.6% selected the alternatives “exactly 150 dollars” or “less than 150 dollars”.

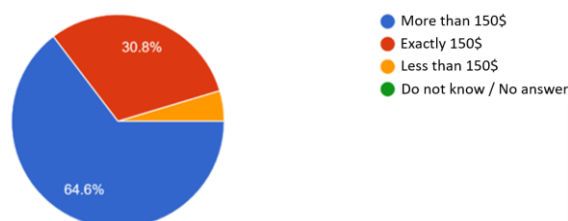


Fig. 14: Imagine that you have 100 US dollars in a savings account and the bank agrees to pay a 10% interest to your account each year. How much more money will you have after five years if you don't take a penny out of your account?

Survey respondents were deemed financially literate if they could correctly answer three out of the five questions (figures 10-14). According to our survey, 92.3% of the respondents achieved passing grade, which means that they understand basic financial concepts. However, the percentage drops dramatically (37%) if we look at respondents who answer five questions correctly. Notwithstanding that, EDIF-ADE students are above the average values in view of the results presented by Klapper et al. [10], which is not surprising given that they have 84 ECTS of basic and specific financial subjects.

4. CONCLUSIONS

This paper presents a study of the Double Degree in Building, Business Administration and Management (EDIF-ADE), the first of the double degrees implemented at the Universidad Politécnica de Madrid (UPM). The study analyses the characteristics of the double degree and the profile of the students attending the programme to understand the keys to success.

The results show that the double degree is a very demanding programme. The EDIF-ADE degree allows students to obtain a very complete and valuable education, merging both building engineering and business administration

disciplines, but it requires significant effort on the part of the students. Its workload is considerably greater than that required to complete any individual degree. Therefore, this double degree should be aimed at highly motivated and qualified applicants.

Most of the students taking EDIF-ADE have higher university entrance marks than the minimum required for this degree. The vast majority don't have an academic background in economics and, though this could influence their results in business administration and management subjects, students perceive that they are not achieving unsatisfactory results in these subjects.

Given the great effort students must make to obtain the double degree, it is to be expected that they will be highly motivated. Surprisingly, the survey did not reveal a strong vocational motivation. Students choose the double degree mainly because having two undergraduate degrees gives them better job prospects.

In addition, students recognise that having a formal education in business administration and management would help them in their professional and personal future. However, only 20% of students would like to pursue master studies in business administration and 5% would like to focus their professional development in this field.

In conclusion, the double degree EDIF-ADE is conceived as an educational program that provides students with qualifications and skills in both building engineering and business, leading graduates to the aforementioned professional fields with greater employability opportunities.

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