COMPETITIVENESS ANALYSIS THROUGH EXPERIMENTAL DESIGN IN UNIVERSITY STUDENTS

L. Castillo Cabay¹, N. Sanchez-Choez², D. Izquierdo García³

¹Universidad Central del Ecuador (ECUADOR)
²Escuela Politécnica Nacional (ECUADOR)
³Universidad Técnica de Ambato (ECUADOR)

Abstract

One of the characteristics of the university student is to be competitive due to the dynamic environment in which he operates daily. In order to analyze competitiveness, a simulation was carried out, in which participated students of Mechanical Engineering and Business Administration. For this purpose, the experimental design was applied, in which a comparative analysis was carried out between two different scenarios, with and without communication of the following variables: gender, career, mobility (local-visitor). The data were analyzed with the statistical software R, whose results allowed to observe that the students are more competitive in their respective place of study; however, it was noted that administration students related to mechanical students are more competitive when they haven’t communication. In addition, it was found that male students unlike women are more competitive when they participate as visitor and maintain communication.

Keywords: Competitiveness, experimental design, comparative analysis.

1 INTRODUCTION

The competitive interest of the university student is determined, in the first place, by the skills and abilities that are incorporated when executing projects in each period of study; second, for the human being, when exposed in a competitive world, there will always be personal and contextual factors that influence performance. The present research focuses on observing the variation of competitiveness when the university student interacts with people from another area of study. In order to determine the variation, it is necessary to identify the competitiveness strategy, because it will describe the way in which the individual or organization will compete in a given market [1].

Strategies are a set of processes that facilitate the acquisition, storage and use of information [2]. If the decision makers are not consistent with the signals emitted by their opponents (in case they do not have complete information), they lose their effectiveness. The strategy is related to the intentions underlying that strategy, while the resulting quality of learning will depend on the intentions and strategies selected [3]. A student with a very high competitive profile may have a predisposition to be less competitive if the context or personal factors demand it. However, for an uncompetitive student the transition to a highly competitive context will be difficult, unless internally they identify their self-regulation abilities and adjust their behavior. On the other hand, the contender or context may encourage or facilitate such a transition.

Motivation is one of the personal factors that allows to maintain a level necessary to undertake and stay in the goal. Students who have multiple well-defined goals are those who are more willing to adapt in dynamic environments and tend to achieve better results [4]. The energy and commitment assigned to action are key elements in competitiveness. Metacognitive strategies are procedures of planning, monitoring and evaluation of cognitive actions, know and regulate mental processes [5]. These strategies are less likely to be taught, i.e. the student recognizes which strategy is suitable to implement each action that is called to decide.

To describe the competitiveness of university students, the following steps were followed: the methodology was established, the results analyzed and finally the conclusions; the same that will be explained in the following sections.
2 METHODOLOGY

2.1 Sample
The sample consisted of 28 referees and 56 university students from the Escuela Politécnica Nacional. The distribution according to each career was: ME (Mechanical Engineering) = 28 students (male=20; female=8); BA (Business Administration) = 28 students (male=10; female=18); the students were undergraduate and were between 18 and 25 years old.

2.2 Instruments
On the variable of interest Competitiveness, it is tried to establish if in any of the scenarios (without or with communication) there is significant difference (the variables in the experimental design are denominated factors) with the factors: Gender, Career and Mobility. For this, an experimental design $2^3$ is simulated, which allowed to identify significant causes and in turn measure the effect that a factor has on the variable of interest.

2.3 Procedure
The study evaluates the competitiveness of students and takes as a reference a score that goes from 0 to 1 point. To assign the score, the student was observed in two scenarios: the first, without communication and the second with communication; the student was observed on six different occasions considering the following factors that are detailed below:

- Gender. - The contender may be of the same gender or different gender.
- Career. - The contender may be from the same career or different career.
- Mobility. - The contender could be L (Local), i.e. he expected his contender or V (Visitor) was approaching to compete with another who was waiting for him.

The first three movements constitute a nested scenario, called without communication, which consists on that the contenders do not have any contact; in the same way, the last three movements make up the nested scenario called with communication.

3 RESULTS
As mentioned before, to analyze competitiveness, the experimental design type $2^3$ was applied, observing 253 cases in the outcomes, with random assignment, for this reason, the formed groups do not have similar size.

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Mobility</th>
<th>Career</th>
<th>Gender</th>
<th>Cases</th>
<th>Mean Without</th>
<th>Mean With</th>
<th>Mean Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L</td>
<td>D</td>
<td>d</td>
<td>49</td>
<td>0.47</td>
<td>0.44</td>
<td>0.45</td>
</tr>
<tr>
<td>2</td>
<td>L</td>
<td>D</td>
<td>s</td>
<td>16</td>
<td>0.48</td>
<td>0.39</td>
<td>0.44</td>
</tr>
<tr>
<td>3</td>
<td>L</td>
<td>S</td>
<td>d</td>
<td>36</td>
<td>0.47</td>
<td>0.44</td>
<td>0.45</td>
</tr>
<tr>
<td>4</td>
<td>L</td>
<td>S</td>
<td>s</td>
<td>26</td>
<td>0.41</td>
<td>0.44</td>
<td>0.43</td>
</tr>
<tr>
<td>5</td>
<td>V</td>
<td>D</td>
<td>d</td>
<td>48</td>
<td>0.43</td>
<td>0.43</td>
<td>0.43</td>
</tr>
<tr>
<td>6</td>
<td>V</td>
<td>D</td>
<td>s</td>
<td>16</td>
<td>0.38</td>
<td>0.54</td>
<td>0.46</td>
</tr>
<tr>
<td>7</td>
<td>V</td>
<td>S</td>
<td>d</td>
<td>35</td>
<td>0.38</td>
<td>0.45</td>
<td>0.41</td>
</tr>
<tr>
<td>8</td>
<td>V</td>
<td>S</td>
<td>s</td>
<td>27</td>
<td>0.45</td>
<td>0.43</td>
<td>0.44</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Mobility</th>
<th>Career</th>
<th>Gender</th>
<th>Cases</th>
<th>Mean Without</th>
<th>Mean With</th>
<th>Mean Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>L</td>
<td>D</td>
<td>d</td>
<td>49</td>
<td>0.19</td>
<td>0.14</td>
<td>0.12</td>
</tr>
<tr>
<td>2</td>
<td>L</td>
<td>D</td>
<td>s</td>
<td>16</td>
<td>0.12</td>
<td>0.11</td>
<td>0.08</td>
</tr>
<tr>
<td>3</td>
<td>L</td>
<td>S</td>
<td>d</td>
<td>36</td>
<td>0.21</td>
<td>0.15</td>
<td>0.12</td>
</tr>
<tr>
<td>4</td>
<td>L</td>
<td>S</td>
<td>s</td>
<td>26</td>
<td>0.19</td>
<td>0.14</td>
<td>0.14</td>
</tr>
<tr>
<td>5</td>
<td>V</td>
<td>D</td>
<td>d</td>
<td>48</td>
<td>0.18</td>
<td>0.14</td>
<td>0.12</td>
</tr>
<tr>
<td>6</td>
<td>V</td>
<td>D</td>
<td>s</td>
<td>16</td>
<td>0.17</td>
<td>0.15</td>
<td>0.11</td>
</tr>
<tr>
<td>7</td>
<td>V</td>
<td>S</td>
<td>d</td>
<td>35</td>
<td>0.19</td>
<td>0.14</td>
<td>0.09</td>
</tr>
<tr>
<td>8</td>
<td>V</td>
<td>S</td>
<td>s</td>
<td>27</td>
<td>0.18</td>
<td>0.15</td>
<td>0.14</td>
</tr>
</tbody>
</table>
Possible combinations will be based on the following: Mobility: L (Local) or V (Visitor), Career: D (Different) or S (Same) and Gender: d (Different) or s (Same); Descriptive statistics of competitiveness are detailed in Table 1.

The trend of the 8 outcomes in their different movements is observed in Fig. 1, whether the mobility L or V of the different career and the same gender present a similar behavior, however, when they move from movement four to movement five this trend is inversed, that is, LDs (Local of Different career and the same gender) goes from an average competitiveness of 0.63 to 0.16 and VDs (Visitor of Different career and the same gender) goes from an average competitiveness of 0.31 to 0.72, In general, it is perceived that as the next movement is moved, the variability decreases.

The p-values are higher than 0.05, which would mean that neither the individual factors nor the possible interactions generate a significant difference in competitiveness. With this background, the 95% confidence intervals are displayed for the competitiveness evaluations in each of the 8 outcomes.

3.1 COMPARATIVE ANALYSIS

3.1.1 Comparative Analysis of Scenarios

Fig. 2. Shows the probability density function estimated for competitiveness in the mobility-related scenarios either as L (Local) or V (Visitor), is shown in the same, it is seen that the density of Lw/o (Local Without communication) is quasi-symmetric while the density function estimated for the competitiveness of the Vw/o (Visitor Without Communication) is somewhat biased towards the left; This gives indications that the competitiveness of Vw/o is greater than the others.
However, the Lw (Local With Communication) or Vw (Visitor With Communication) scenario, have approximately the same density function and present, a priori, a similar probability law for competitiveness.

3.1.2 Comparative Analysis of Factors in Scenarios

The factors related to the differences between scenarios can be seen in Fig. 3. It is worth mentioning that the average differences between the two scenarios that are above the horizontal line 0 are those factors that perform in the scenario without communication, while those below the line are those that perform better on the stage with communication.

The factors that are most competitive when working without communication are the following: LDd, LDs, LSd and VSs, because the differences of the average of the scenarios are greater than zero, whereas the factors that have their mean difference below the line, are those that present better competitive performance when working with communication and these are: LSs, VDd, VDs and VSD. It should be noted that within the first group the most prominent is the factor LDs that presents a difference of averages of 0.09 being greater its tendency to work without communication, on the other hand, the factors that are more competitive in the scenario with communication are VDs and VSD, Because the difference of the averages are 0.16 and 0.07 respectively.

3.1.3 Analysis of mobility according to movements.

In Fig. 4 it can be observed that in the first three movements the competitiveness of the local is increasing, passing the average of 0.42 to 0.52.
Unlike the Visitors, who in the first three movements present a decreasing competitiveness, going from an average of 0.50 to 0.36, when they change the scenario, in the last three movements it is seen that the variability of the means of the factors L and V decrease considerably.

3.1.4 Analysis of mobility according to the career

Fig. 5. shows that the mobility of BA (Business Administration) are more competitive than ME (Mechanical Engineering) students, apart from movement two where both careers report an average competitiveness of 0.41; Students of the BA career when they visit their contender also generally have a higher average than the students of the other career, except for the first movement where ME students have a higher average of competitiveness.

3.1.5 Analysis of mobility according to gender

In the mobility L, of the gender F (Female) presents a superior average of the gender M (Male), except for movement four, where the average competitiveness of the premises of gender M is superior to those of the gender F; on the other hand, it can be stated that in general the average competitiveness of the mobility V of the gender M is greater than the mobility V of the gender F, with the exception of movement four, where a shock is visualized when passing the stage without a with communication. As can be seen in Fig.6.

Fig. 5. Mean of movements related to mobility and career

Fig. 6. Mean of movements related to mobility and gender
4 CONCLUSIONS

Students of the Mechanical Engineering degree, when the mobility status is Local, generally increases the average of their competitiveness, while the students of the Business Administration degree, when the mobility status is Visitor, generally increases the average of their competitiveness; People of local mobility of Female gender are from the degrees: Business Administration or Mechanical Engineering are on average more competitive of those of gender Male. Male gender students are more competitive when the mobility status is Visitor.

It is evident that competitiveness is related to the scenarios: without and with communication in general terms, therefore, it is concluded that Business Administration students are more competitive than Mechanical Engineering students when they are in a scenario where they do not maintain communication and that the Male, when the status is Visitor and are in the communication scenario, are more competitive.

REFERENCES


