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Artículos científicos

Tablero de indicadores de desempeño académico en la carrera de ingeniería Industrial de la UABC

Performance Dashboard in the Industrial Engineering of the UABC

Conselho de indicadores de desempenho acadêmico na carreira de Engenharia Industrial da UABC

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Resumen

Este trabajo de investigación cualitativa muestra los resultados del seguimiento realizado a los profesores de la carrera de ingeniería Industrial de la Facultad de Ciencias de la Ingeniería y Tecnología de la Universidad Autónoma de Baja California durante los semestres 2020-1, 2020-2 y 2021-1. Dicho seguimiento se dio con apoyo de un tablero de control de indicadores de desempeño académico que mide el grado de cumplimiento de las actividades académicas y culturales que contribuyen a la formación de estudiantes. Entre los resultados procesados con Minitab 17 destaca que los profesores obtuvieron una calificación de 90 en su desempeño como docentes según la opinión de los estudiantes. Las conclusiones confirman que la implementación de un tablero de indicadores de desempeño académico permite mantener y garantizar la calidad educativa.

Palabras clave: ingeniería industrial, instituciones de educación superior, tablero de control, tecnología educativa.

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Abstract

This qualitative research work shows the results of the monitoring carried out on the professors of the Industrial Engineering career of the Faculty of Engineering Sciences and Technology of the Universidad Autónoma de Baja California during the semesters 2020-1, 2020-2 and 2021- 1. Said follow-up was given with the support of a control panel of academic performance indicators that measures the degree of compliance with the academic and cultural activities that contribute to the formation of students. Among the results processed with Minitab 17, it stands out that the teachers obtained a grade of 90 in their performance as teachers according to the opinion of the students. The conclusions confirm that the implementation of a dashboard of academic performance indicators allows to maintain and guarantee educational quality.

Keywords: industrial engineering, higher education institutions, control panel, educational technology.

Resumo

Este trabalho de pesquisa qualitativa mostra os resultados do monitoramento realizado nos professores da carreira de Engenharia Industrial da Faculdade de Ciências da Engenharia e Tecnologia da Universidade Autônoma da Baixa Califórnia durante os semestres 2020-1, 2020-2 e 2021-1. Esse acompanhamento se deu com o apoio de um painel de controle de indicadores de desempenho acadêmico que mede o grau de cumprimento das atividades acadêmicas e culturais que contribuem para a formação dos alunos. Dentre os resultados processados com o Minitab 17, destaca-se que os professores obtiveram nota 90 em seu desempenho como professores segundo a opinião dos alunos. As conclusões confirmam que a implementação de um dashboard de indicadores de desempenho académico permite manter e garantir a qualidade educativa.

Palavras-chave: engenharia industrial, instituições de ensino superior, dashboard, tecnologia educacional.

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Introduction

As a result of the covid-19 pandemic, and considering that in recent years the need to use educational technology tools that improve academic quality within higher education institutions (HEIs) has increased, the opportunity arose to implement a system for monitoring and evaluating the indicators in the Industrial Engineering program of the Faculty of Engineering Sciences and Technology (FCITEC) of the Autonomous University of Baja California (UABC). Among the specialized literature on the subject, it was found that dashboards are an excellent instrument for measuring performance in organizations, so one of these management tools was implemented. In this case, six key performance indicators related to the fulfillment of activities, teacher training, professional training and teaching performance from the point of view of the students of said career during the semesters 2020-1, 2020 were taken as reference. -2 and 2021-1.

Now, given the importance of making efficient proposals when monitoring academic performance in any HEI, the implementation and monitoring of the Academic Performance Indicator Board (TIDA), as it was decided to name it, in the Industrial Engineering program represented a great challenge, but with very encouraging results, since the FCITEC of the UABC, like many of the public faculties and universities in Mexico, presents a series of deficiencies in terms of service processes, as well as within the educational programs .

Delving a little into the matter, the educational technology tools that are most used to measure academic performance within HEIs are balanced scorecards. According to Charro, Palermo, Valverde and Fabozzi (2012), they bring benefits to students based on the optimization of resources. The same was more than evident in the results found during the semesters 2020-1, 2020-2 and 2021-1 in this study. Without a doubt, implementing the performance dashboards allowed measuring the performance of the professors who work within the Industrial Engineering career at the FCITEC of the UABC.

The methodology used for the design of the TIDA is based on the Kaplan and Norton Balance Scorecard (BSC) model and the Assessment Instrument for Sustainability in Higher Education (Aishe), whose key performance indicators (KPI) are they adapted and oriented towards the substantive activities of university professors: teaching and research. Designing and implementing a control panel, one of the best tools that exist to align human resources in a strategic way, requires a process of training and direction in the management of intellectual capital. However, once implemented, the participants can enjoy a culture where

knowledge is acquired and shared, where the fear of mistakes disappears, direct and transparent communication is possible, action is emphasized, timely information is available that enables permanently review the strategy and where technology is constantly incorporated, among other benefits it brings to the organization.

For the present work, the investigations of Zabalo and Dalvit (2020), Chávez, Hurtado, Martínez, Rodríguez and Sánchez (2010) and Garrote (2005) were taken as reference. These antecedents guided the implementation of the TIDA within the Industrial Engineering program of the FCITEC of the UABC. The KPIs considered were the following:

1) Fulfillment of activities.

2) Teacher training courses.

3) Disciplinary training courses.

4) Diploma in basic skills for university teaching.

5) Diploma in teaching skills for distance education.

6) Teaching evaluations in the opinion of students.

It should be noted that the latter was one of the most important key indicators to measure the academic performance of the teachers who participate in the different activities of the educational program in question. Next, the theoretical framework of the measurement instrument used in this research study is presented.

Control panel in the higher education sector

One of the great advantages of implementing a control panel in the coordination of educational programs is that it allows timely monitoring of the academic activities scheduled in each semester, as is the case of the study presented in this paper. According to Pierre (2017), the control panel, dashboard, dashboard or balanced scorecard is one of the tools most used by middle managers and senior managers of any organization, and HEIs are no exception. It was in 1992 when Kaplan and Norton suggested this type of tool that allows monitoring and efficient management of indicators in order to complete the objectives and goals set by an organization.

Another of the main reasons why the opportunity to implement the TIDA in Industrial Engineering was presented is because recently, in 2020, it went through a re-accreditation process by the Inter-institutional Committees for the Evaluation of Higher Education (Ciees) . Precisely, the development of this quality management system is intended to measure the

academic performance of teachers who teach classes in this program. Indeed, as Malla (2018) says, these resources have become almost essential in recent years to ensure educational quality.

However, it is not easy to interpret numbers and statistics of indicators of academic performance. In this line, Silva (2021) states that dashboards are tools that allow information to be obtained in a visual and easily understood way, even for people not necessarily related to the indicators presented, which speeds up decision-making in time. real, as can be seen in the Results and Conclusions section of this writing.

For his part, Pierre (2017) highlights the role of KPIs in performance management, since they are a key to proactively make adjustments, as well as to alert and highlight potential risks, in any area of a company. organization, although especially in the educational sector, that may exist in a decision-making process. Regarding the KPIs, Parmenter (2015, cited in Pierre, 2017) says the following:

> Performance indicators, on the other hand, are measures that can be tied to a team or a set of teams working together for a common purpose. A good or bad performance is now the responsibility of a team. These metrics give us clarity and a sense of ownership (p. 21).

Finally, in summary, implementing a dashboard can bring the following benefits:

- They communicate the strategy: the collaborators of the work team are clear about what they must do in their activities to achieve the expected results.
- Refine strategy: Senior managers can make a number of minor changes and adjustments along the way toward achieving results.
- Increase visibility: since data is collected frequently derived from daily operational work, these dashboards allow middle managers and senior managers to visualize in real time the status of the corresponding area of the organization.
- They increase coordination: each one of the collaborators is integrated into the work area, since this type of performance management tools stimulates teamwork.
- Increase motivation: derived from the real-time publication of performance indicators, a healthy competition between peers is generated, which in turn brings an increase in productivity.

- Constant vision of the business: this is due to the fact that the activities to be carried out are clearly defined through indicators that simplify the data generated in the daily operation of the organization.
- Reduce costs and redundancy: due to the standardization of data and indicators, control panels avoid redundancy in activities.
- Empowerment of users: dashboards promote the empowerment of employees and avoid dependency on other ways of communicating information.
- They deliver processed information: having processed data allows the organization's collaborators to take action in real time, helping to solve problems.

Based on the foregoing, and as stated by Aristizábal (2019) in relation to the importance of educational technology tools such as business intelligence, learning analytics and performance dashboards, it is evident the relevance of the document empirical studies such as the case of the implementation referred to in this document. Consequently, the methodology used in the design of the TIDA within the educational program in question is explained immediately, which, as an advance, has contributed to improving the indicators and educational quality.

Methodology

This writing is derived from the documentation of a qualitative and descriptive case study (Martínez, 2006) carried out in the Industrial Engineering educational program of the FCITEC of the UABC during the semesters 2020-1, 2020-2 and 2021- 1 (Garcia and Santana, 2021). For this, the convenience sample selection method was used, as proposed by Otzen and Manterola (2017). The foregoing made it possible to show the benefits of implementing, as a performance measurement instrument, the indicators of the teachers who participate in the educational program in the different academic activities and that strengthen educational quality. It should be remembered that the Aishe supported the design of the TIDA, mainly in indicators oriented to the two main substantive activities of a higher education institution, teaching and research (Pierre, 2017).

From the coordination of the educational program of Industrial Engineering of the UABC, the TIDA was designed. Next, each of the indicators listed above is detailed:

1) Fulfillment of activities. The % of activities that teachers participate in during the semester is reported.

2) Teacher training courses. The number of courses to strengthen teaching skills that teachers take during the semester is reported.

3) Disciplinary training courses. The number of disciplinary courses taken by teachers during the semester is reported.

4) Diploma in basic skills for university teaching. The number of teachers who complete the diploma course during the semester is reported.

5) Diploma in teaching skills for distance education. The number of teachers who complete the diploma course during the semester is reported.

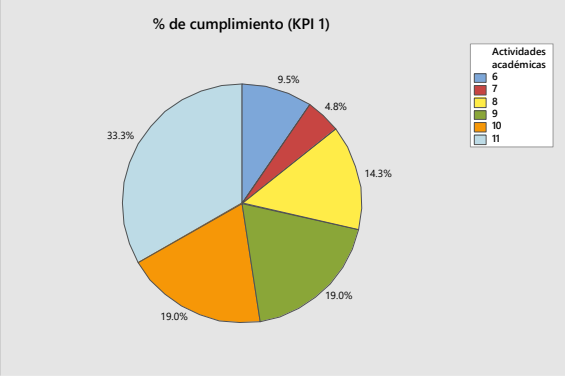
6) Teaching evaluations in the opinion of students. The grades obtained by the teachers, in the opinion of the students, who teach theoretical, practical and virtual subjects during the semester are reported.

Results

During the 2020-1 semester, the six KPIs of the 21 professors who are part of the UABC FCITEC Industrial Engineering teaching staff were followed up and the following was found:

Figure 1 shows that 33.3% of teachers participated in 11 academic activities, which means that only 7 of the 21 teachers of the Industrial Engineering career completed 100% of this performance indicator. While 9.5% of the teachers completed only 6 of the 11 academic activities, that is, only 2 of the 21 teachers.

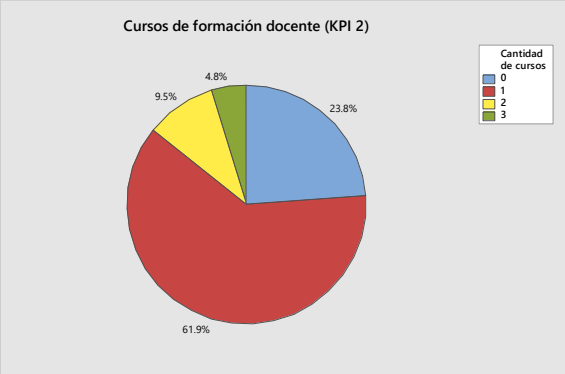
Figure 1. Compliance activities (KPI 1) 2020-1



Source: self made

Regarding the second KPI in Figure 2, it was found that almost 62% of teachers took a teacher training course, that is, 13 of 21 teachers showed commitment to improving their teaching skills. And among the courses that teachers reported, are gamification, blackboard for online work, free Internet applications for teaching, flipped classroom and inclusive education strategies in higher education, among others. On the other hand, almost 24%, that is, five of the teachers who taught in the Industrial Engineering educational program during the 2020-1 semester, did not take any course to improve their performance as teachers.

Figura 2. Cursos de formación docente (KPI 2) 2020-1



Source: self made

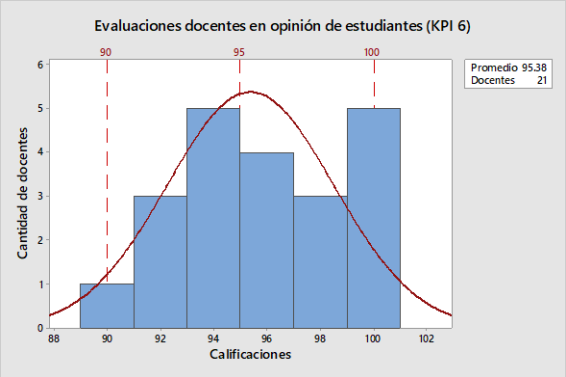
Within the third KPI, related to the disciplinary training of teachers, according to the results obtained, approximately 38% of teachers, that is, eight teachers, took disciplinary training courses, while 62%, that is, 13 of 21 teachers , did not strengthen their professional skills during the 2020-1 semester.

As for the fourth KPI, only 20% of the teachers who participate in the industrial engineering educational program had completed the diploma in basic skills for university teaching, that is, only 4 of 21 teachers.

In relation to the fifth KPI, it was found that within the industrial engineering educational program, only 2 teachers of the 21 who teach classes have a diploma in teaching skills for distance education.

Perhaps one of the most relevant KPIs to improve educational quality within the Industrial Engineering educational program that is followed up through the TIDA is number six, which has to do with the qualification that the teachers obtained in the opinion of the students. . As can be seen in figure 3, the average grade obtained was 95 in the 2020-1 semester, and 12 of 21 teachers obtained 95 or more.

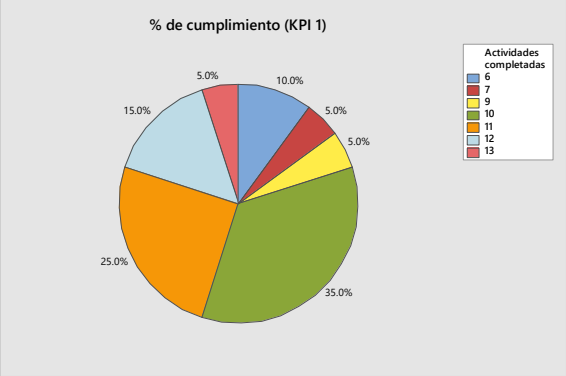
Figure 3. Teacher evaluations in student opinion (KPI 6) 2020-1



Source: self made

Regarding the results obtained in the KPIs during the 2020-2 semester, according to Figure 4, only one teacher completed all the academic activities, and 2 of 20 teachers completed only 6 of 13 activities scheduled during the semester within the educational program of Industrial Engineering of the FCITEC of the UABC.

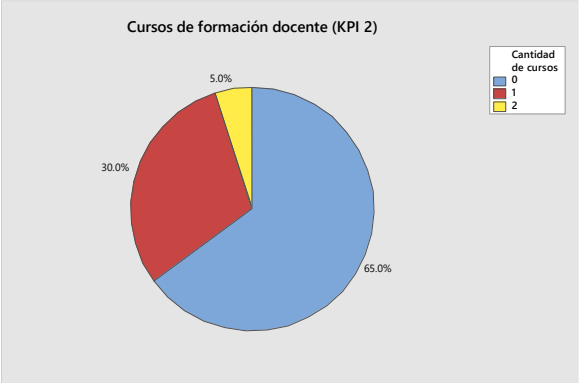
Figure 4. Compliance with activities (KPI 1) 2020-2



Source: self made

Figure 5, referring to teacher training courses (KPI 2), shows that 35% of teachers took at least one course in 2020-2, that is, 7 out of 20 teachers strengthened their skills as teachers, while 13 of the 20 teachers did not.

Figure 5. Teacher training courses (KPI 2) 2020-2



Source: self made

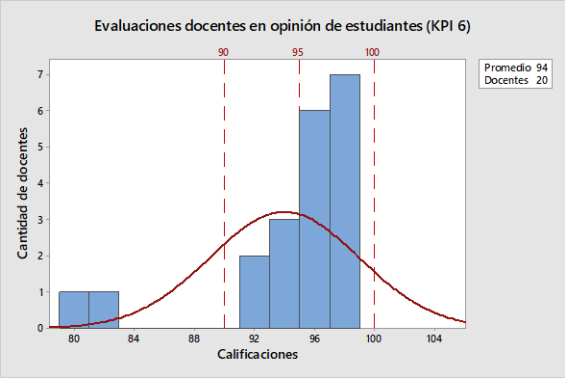
In relation to the levels achieved by the teachers of the Industrial Engineering educational program (KPI 3), it was found that only one teacher was updated in the area of his professional discipline during the 2020-2 semester, while 19 of 20 teachers did not take some professional training course.

Now, a total of 4 teachers of the 20 who teach in the Industrial Engineering educational program had the basic skills diploma for university teaching during 2020-2. In other words, 16 of 20 teachers did not have such a diploma (KPI 4).

As for the academic staff who had the teaching skills diploma for distance education, only one teacher did, while the rest of the teachers who teach classes in the Industrial Engineering educational program (95%) still did not have this diploma.

Figure 6 has to do with the average grades that professors obtained during the 2020-2 semester. The average grade obtained by teachers was 94; 13 of 20 teachers obtained a grade of 95 or higher.

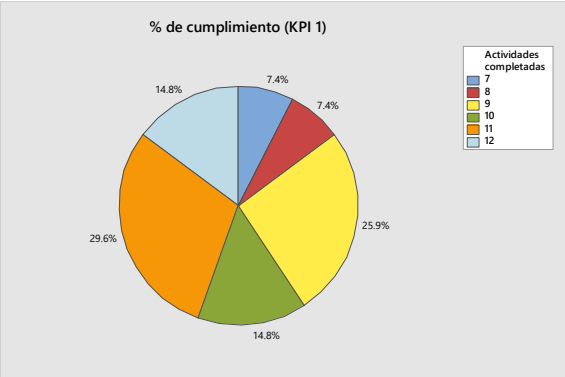
Figure 6. Teacher evaluations in the opinion of students (KPI 6) 2020-2



Source: self made

On the other hand, Figure 7 shows that the percentage of compliance with academic activities by teachers who collaborated during the 2021-1 semester in Industrial Engineering was 100% in 4 teachers out of 27, while 2 out of 27 teachers reached 58% compliance.

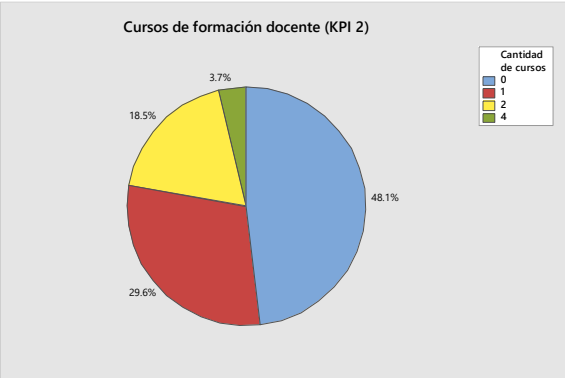
Figure 7. Compliance activities (KPI 1) 2021-1



Source: self made

In addition to the above, figure 8 shows that 14 of the 27 teachers who taught classes took at least one course to strengthen their skills as teachers, while 13 of the 27 teachers did not take courses during the 2021-1 semester (KPIs 2).

Figure 8. Teacher training courses (KPI 2) 2021-1



Source: self made

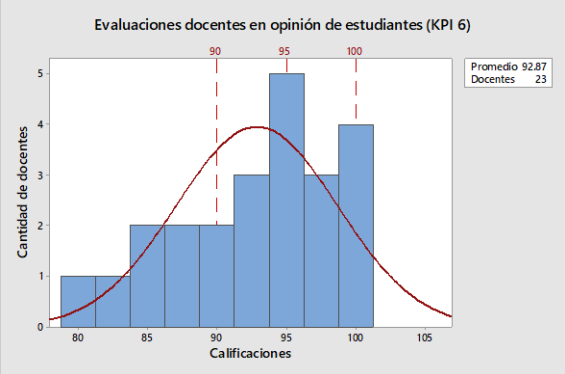
Regarding the subject of disciplinary training courses (KPI 3 of the control panel), during the 2021-1 semester, the percentage of teachers who enrolled in at least one professional updating course was 11%, that is, only 3 teachers of 27.

Likewise, in the 2021-1 semester, 3 out of 27 (11%) took at least one professional training course, while the remaining 24 teachers in the same program did not show interest in updating their professional skills (KPI 4).

On the other hand, only two teachers reported having the teaching skills diploma for distance education during 2021-1, which shows that 25 teachers (92%) of the total number of teachers who teach classes in the engineering program Industrial did not have this diploma in the period in question (KPI 5).

Finally, during the 2021-1 semester, an average of 92.87 was obtained in the teaching evaluations, according to the opinion of the students. Additionally, 12 of 27 teachers at least scored 95 or higher, as seen in Figure 9.

Figure 9. Teaching evaluations in the opinion of students (KPI 6) 2021-1



Source: self made

From the above, it can be seen that the monitoring of the six KPIs proposed in the TIDA of the Industrial Engineering educational program helped to determine and maintain the academic quality within the faculty, which facilitated the management of the work team, despite of the pandemic during the semesters 2020-1, 2020-2 and 2021-1.

Discussion

The results achieved and the help provided by TIDA in decision-making within the UABC Industrial Engineering educational program are evident, which served to monitor each of the KPIs and the academic performance of the teachers who were teaching classes in the semesters 2020-1, 2020-2 and 2021-1, which reinforces what was stated by Eckerson (2012, cited in Pierre, 2017), who speaks of the great benefits of this type of resources to HEIs where they are implement.

On the other hand, within the limitations that this research had, it is not being able to count on the results of the semester 2021-2 to be able to carry out a comparative study between the

years 2020 and 2021 that would allow extending the temporality of the follow-up of the KPI of the Industrial Engineering educational program of the FCITEC of the UABC.

In relation to the strengths of this study, it was possible to identify that there was availability and ease of access to information and statistical data that would allow the investigation to be carried out. In addition, that the educational technology tool used, the TIDA, was approved by the directors of the FCITEC of the UABC.

It is clear that the results of this research reiterate the importance of implementing methodologies such as Aishe for the monitoring and follow-up of performance indicators in HEIs (Pierre, 2017).

Finally, not having sufficient resources prevented carrying out a comparative study with other FCITEC programs, or even in some universities in other countries, to have results from other areas in order to perform a validation of the TIDA instrument and generate an educational technology tool that pays to maintain a more efficient and effective resource management.

Conclusions

Having a performance control board, in the case of this study the TIDA (based on the Aishe), contributed to improve the management of human, economic and infrastructure resources within the FCITEC Industrial Engineering educational program.

Within the results of the TIDA corresponding to the semesters 2020-1, 2020-2 and 2021-1 of the Industrial Engineering educational program, the teachers complied with the KPIs 1, 2 and 6.

On the other hand, an area for improvement was found, since few teachers have professional updating courses or diplomas (KPI 3, 4 and 5).

Particularly, in terms of compliance with academic activities (KPI 1), there was a level of compliance by teachers attached to the FCITEC Industrial Engineering educational program of 45%, which reflects good management management.

Regarding the results obtained in KPI 2, which is oriented to teacher training, a participation in the 2020-1 semester of 62% of teachers was identified at the beginning of the pandemic, and dropped to 35% in the middle of the pandemic during the 2020-2 semester, but the participation reached in the 2021-1 courses rebounded with 45%.

Definitely, professional training has not managed to rebound according to the results obtained in this research, since in the semester of 2020-1 the teachers of the Industrial Engineering

career participated with 38%, while in 2020-2 only 5% of teachers took some disciplinary training course, and in the 2021-1 semester 11% did so.

KPI 4 refers to completing a diploma on basic skills of university teaching. In this regard, in the semesters 2020-1 and 2020-2 there were 20% of the group of teachers, while in 2021-1 it dropped to 11%, since one of the teachers who had this diploma stopped teaching classes at interior of the Industrial Engineering career.

In relation to KPI 5 of the degree of having completed the diploma in distance education offered by the UABC, in 2020-1 there were 10% of teachers with this diploma, while in 2020-2 only 5% had this diploma, and in 2021-1 it was increased to 7%.

Finally, like KPI 1, KPI 6 is one of the most important key performance indicators in terms of academic performance, and it has to do with the grade obtained by the teachers who teach classes within the engineering educational program. industry of the FCITEC. In the 2020-1 semester, the average grade was 95, while in 2020-2 it was 94 and finally in 2021-1 the teachers obtained an average of 93.

Currently, the UABC FCITEC Industrial Engineering educational program continues to operate with the support of TIDA.

Future lines of research

From the findings and results of this research, possible lines of research have emerged that can be reviewed and studied at another time, leaving open the invitation for other researchers to join the design of a performance dashboard such as TIDA, considering the recent revolution 4.0, which allow teachers' academic performance to be measured not only from the evaluations they receive from students, but from other KPIs that add to the comprehensive training of students in an educational program of public universities in Mexico, and improve the management of resources, which are reduced every day by the government.

Finally, it would be necessary to consider exploring other educational technology tools such as learning analytics to improve the monitoring of KPIs in HEIs, not only in Mexico, but in any part of the world. In other words, take advantage of the opening and increase of emerging technologies that contribute to the management of resources in the educational system and, derived from it, improve the academic performance of the teachers responsible for the operation of the study plans.

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