Strategy Map design based on the Balance Scorecard Framework for Higher Education Institutions

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***Resumen*—Educational technology enables institutions to enhance their educative process as well as the services they provide to students and society. For this reason, higher education institutions for several years invested resources in technology to develop competitive advantages. However, they can underestimate the complexity of integrating technology in the educative process leading to underutilization of these resources. The COVID-19 pandemic changed many aspects in human life including the configuration of higher education institutions. In this sense, the lockdown implemented in several countries acelerated the process of integrating Education Technology (EdTech) in the education process. Nowadays, the new normality in education relies on diverse hardware and software platforms. The consequences of the pandemic pushed institutions to make fast decisions about the use of these platforms in education without plan developed in advanced. This paper presents an strategy map based on the Balanced Scorecard Framework to maximize the benefits of using EdTech in higher education institutions. The results presented in this work aim to enable institutions to maximize the use of their resources, improve their productivity by the means of fusing EdTech and the educative process based on the lessons learnt during the pandemic.**

I. Introduction

In the last few decades, technological advances have changed dramatically most human activities and education is not an exception. Internet of Things, Cloud Computing, Virtual Reality, Social Media, 3D printing, Machine Learning, Analytics, Learning Management Systems, Multimedia Studio, among others are being adopted by educational institutions around the world. In this sense, the term educational technology (EdTech) refers to the use of any technology in the educative process [3].

Among the educational technologies the Learning Management Systems (LMS) plays a key role in a higher education institution (HEI). Since the mid-1990's most instutitions around the world developed and adopted diverse LMS. The gained experience in this field during the last decades has consolidated the use of this platform in the educative process. This phenomenon is observed in the growth of the open-source and proprietary LMS market[1].

In several institutions, the deployment of LMS was complemented with the installation of a multimedia studio to produce material for educational purposes. The content produced by HEIs fostered the deployement of Massive Open Online Courses (MOOC), which made feasible to expand worldwide education in diverse fields [5]. This phenomema was lidered by most prestigous institutions in the world, who had the resources to make this possible. In the case of emerging countries this process was slowly under development until 2020.

The COVID-19 pandemic led to unprecedented health and socio-economic crisis around the world and has severely impacted the entire higher education sector [16]. In response to this emergency situation, governments around the world implemented lockdown measures. HEIs had different technological maturity levels to switch from on-site classes to a distance education mode within a short period of time. HEIs managers, staff, professors and students had to deal with a new educational world where EdTech became the only

[1]https://www.gartner.com/reviews/market/higher-education-learning-management-systems

way to continue remotely educating.

Argentina went through the largest lockdown in history and even today most of educational instutitions are still working remotely or implementing a mixed education mode. This unexpected process of education and technology integration was improvised by most educational communities. As a consequence, this integration were developed by the contribution of individual efforts without a planning, strategy or management control.

The education sector has changed for good and this historical moment is an opportunity for institutions to take advantage of all efforts made so far to integrate EdTech and education. This process is complex and it requires a mid-term strategic plan to optimize, organize, improve, align and adjust the actions performed during the lockdown. A post pandemic era can be an unprecedent opportunity for HEIs to improve dramatically the education process based on EdTech. To this end, it is important to take advantages of the lessons learnt during the lockdown and designing a strategy plan to define maximize the benefits of EdTech in education.

Different approaches have been proposed to develop strategy in both business and academia. The frameworks mostly used in performance measurement in public organizations and higher education institutions are: i) the Balanced Scorecard [12], ii) the European Quality Framework Model (EFQM) [9], iii) aggregated Key Performance Indicators [6] and iv) Dashboards [22].

A large volume of content about the Balanced Scorecard framework has been written since its creation. The flexibility of the framework and the diverse areas where it can be applied increased the number of publications about this subject. In this regard, this chapter only addresses the main concepts underlying the strategy planning and the instrument for the strategy performance management.

[11] affirm that the Balanced Scorecard should be applied as a template for the organization rather than a rigid methodology to measure strategy. This statement has been demonstrated by the wide range of works in scientific literature where the framework has applied to different business, strategic challenges, and higher education institutions [4].

The methodologies for strategy development provide general guidelines because every institution has different characteristics. For this reason, specific business models require a tailored strategy and performance management design. In this paper, we propose the use of the Balanced Scorecard framework for strategy design to integrate EdTech and education based on the actions performed during the COVID-19 pandemic. The motivation to use this framework is its widely use showed by the literature diverse organizations and purposes over the last decades including HEIs [12].

The aspects that defines the paper content are the following.

1. **Problem identification:** frameworks for strategy and performance management only provide general guidelines about their use and application.
2. **Motivation:** the complexity of fusing EdTech and the educative process to take full advantage of their benefits require the definition of a mid-term strategy.
3. **Research question:** what is the strategy definition needed by HEI managers to exploit the benefits of educational technology?
4. **Hypothesis:** the Balanced Scorecard framework can be applied to outline a strategy to obtain the maximum benefits of educational technology in HEIs.
5. **Aim:** the aim of this work is *"to design a mid-term strategy using the Balanced Scorecard framework to maximize the benefits of educational technology in HEIs"*

The contributions of this work are the following:

1. The design of a strategy map based on twelve strategic objectives to maximize the benefits of educational technology in HEIs.
2. Review of different study cases from HEIs around the world where the Balance Scorecard is applied.
3. Analysis of the strategic objectives stated by the HEIs study cases analyzed.
4. Assessment of the mission statement of different universities around the world.

The content of this document is organized as follow. In section II the main related works are describe and analyzed. Section III presents the strategy map design based on the Balanced Scorecard Framework. Finally, section IV describes the paper conclusions and future works.

II. Related Works

The trend of higher education institutions around the world is to focus on performance management. This phenomenon can be observed in the growing competition and marketization within universities. In different countries, the government has begun a process of reducing the financial support for higher education promoting the competition among educational institutions and the pursuit of self-dependency [13].

In a competitive environment, higher education institutions must fulfil more rigours requirements in terms of accountability, education quality, metrics defined by accreditation agencies, among others. As a consequence, institutions need to design performance management systems based on methodologies developed for business and industry [19].

In this context [2] formulates the following questions for institutions answer: "Are schools meeting their missions? Are schools offering educational value to their students? Can schools improve their processes and create additional value while containing or reducing costs? Are schools effectively and efficiently using scarce resources such as intellectual capital, state appropriations, other revenue sources, people, and time?". To answer these questions performance measurement plays a key role.

Performance measurement in university contexts is a complex process because of different reasons. Products

and services are intangible nature difficult the definition of performance measures. A clear definition of customer can be challenging taking into account teachers, students, non-teaching staff, parents, government, funding agencies, accreditors, validators, auditors, and assessors [23].

The diversity of customers in higher education institutions creates disparate demands that require a large number of resources and the implementation of heterogeneous processes. The definition of strategy in this context is an arduous process as well as the design of performance measurement mechanisms [17].

There are different frameworks to design performance management systems most of them applied in the industry. Universities have modified some of these frameworks to develop performance measurement mechanisms. The frameworks are the BSC, European Foundation for Quality Management, Aggregated Key Performance Indicators, and Dashboards.

[8] compared the frameworks implemented in higher education institutions and results show that the BSC can provide foresight and retrospective performance unlike the information provided by aggregated key performance indicators. The scorecard can help to assess the strategy implementation without the bureaucracy potentially introduced by the complex European Foundation for Quality Management model. Additionally, the BSC implementation does not require costly management information platforms as dashboards. The study concludes the BSC offers a holistic approach to assist in the alignment of communication and strategy in universities.

The literature reports numerous works that depict how universities from different countries have implemented a BSC to measure performance for different purposes. Although [10] define a balanced scorecard with four perspectives for the industry they propose the possibility of amending the framework for non-profit organizations.

This section presents the assessment of seven works about the adoption of a BSC in higher education institutions based on the four perspectives proposed by [10]. Then, an analysis of the literature review is presented taking into account the strategic objectives of the works described and the mission statements of worldwide ranked universities. The result of this analysis provided the foundation for the strategy map design.

II-A. BSC standard designs

This subsection describes seven works that depict BSC designs in higher education institutions. Throughout the different proposals, it is feasible to observe how flexible the framework is to address performance measurement requirements from diverse areas. The BSC designs include budget management, distant learning environments, strategic management, and development of competitive advantages in private universities. Next, works in the aforementioned areas are presented.

II-A1. BSC for budget management: University financial management is a core process where budget execution plays a key role. The budgeting methods of most universities are static and they are focus on the results of budget implementation. However, there are several problems with current methods such as the impact of changes in the environment. The budget execution only focus on results and ignores the process itself leading to a lack of a mechanism to evaluate the performance of budget implementation.

In this context, the authors [14] propose the use of BSC framework to evaluate the performance of budget management. The scorecard consists of the four perspectives proposed by [10] where each perspective has the following focus for this particular work.

1. Financial: it aims to assess the efficiency of budget management. Despite universities are non-profit organizations, they must efficiently manage the available funds.
2. Customer: it includes students as the most important clients. In this sense, student satisfaction, employment rate, average marks, participation in research, among others are important indicators.
3. Internal processes: it focuses on the efficiency in university processes.
4. Learning and growth: it aims to assess the manager's skills to efficiently execute the budget.

The authors concluded that budget management in educational institutions can help to establish an incentive and reward mechanism. Since a BSC focus on internal management and control processes, execution of real-time budget execution it is feasible to assess the performance of each actor.

II-A2. BSC for strategy management: Universities in Sri Lankan have implemented the BSC framework at department level under different faculties [21]. The framework makes it possible to use the scorecard to improve the evaluation process of strategy designed at each university.

The following list shows the perspectives implemented in the BSC of each university and the type of measurements for each one.

1. Customer: quality of graduate, quality of services to the community, and job satisfaction.
2. Internal Perspectives Business Process: quality of teaching, learning process and other activities and management information
3. Learning and Growth: quality assurance, quality of planning, quality of academic staff development, and quality of management staff development.
4. Financial: cost focus, revenue focus, and survive focus.

In contrast to the perspective order used by profit companies, the financial perspective takes the last place in the strategy map. The customer perspective shows how university activities are oriented to students.

II-A3. BSC for distant learning environment: [18] shows the use of a BSC in higher education distant learning environment. In general, universities are focused on performance metrics associated with learning, however, this works highlights the importance of financial strategies for higher education. They developed a second-generation scorecard for a university's Division of Continuing Studies (DCS) created to provide distance education to military members in Canada.

1. Stakeholder perspective: attract new students, retain existing students, meet and exceed service expectations, and foster support for university programs.
2. Business process perspective: promote program offerings, continued program validation, apply a systems approach to university activities, effectively administer students, strategic facilitation of program development, and manage stakeholder dependencies.
3. Learning and growth perspective: improve IM/IT capability, prioritize innovations, attract and develop quality faculty, attract and develop quality staff, and improve knowledge management.
4. Financial perspective: ensure fiscal responsibility, enable program self-sufficiency, and create baseline costs for all programs.

In universities that operate under online environments, activities related to the learning and growth perspective are critical success factors. In this sense, the strategic goals are based on human, information, and organization capitals.

II-A4. BSC for business college : [15] presents a tailored BSC for a business college that has undergraduate programs in accounting, business information systems, finance, management and marketing, and an MBA program. The college enrolls approximately 1,600 students with approximately 40 tenure-track faculty. The work provides a guide for the implementation of a BSC including the description of specific objectives for the college of business. The perspectives included and their goals are the following.

1. Financial: building endowment, fundraising, annual giving; increased grants; develop revenue streams; increased state appropriation; increased student fees; profitable program mix; increase teaching productivity; to be financially sound and to financially succeed.
2. Stakeholder: attract high-quality students; develop high-quality students; graduate high-quality students; student satisfaction; business community (employer); faculty satisfaction; alumni; parents; service to the university; teaching quality; academic excellence and quality research contributions.
3. Internal processes: teaching excellence; excellence in developing learning and learning skills; curriculum excellence and innovation; introduction of new programs/innovations; quality faculty; the currency of faculty and classroom material/experiences; production efficiency and student services effectiveness, including advising.
4. Learning and growth: faculty development; technology leadership; teaching/learning innovations; measure, reward, and evaluate goal attainment; establish a broad-based and continuous strategic planning process and adequate physical facilities.

The authors concluded that the BSC framework is suitable to align a wide variety of measures with the mission and strategy of a college of business.

II-A5. BSC design for tertiary institutions in India: [20] propose a BSC to manage tertiary institutions of education in India including a university, affiliate college, autonomous institution, or private educational institution. The scorecard design aims to translate the mission of knowledge creation, sharing, and application into a comprehensive and coherent tool for stakeholders. The perspectives included and their objectives are the following.

1. Customer: highly valued program; quality academic advising; flexible course scheduling; quality instruction; effective student placement; growth opportunities; learning opportunities; knowledge update with the passage of time; knowledge reinforcement; hiring quality students and knowledge extension.
2. Internal business: to achieve continuous improvement of services, facilities and resources; to improve new product and service development; quality assurance; internship program; cost efficiency and unique or specialized curriculum.
3. Innovation and learning: faculty professional growth; staff motivation and development; incorporating technology into teaching; innovation in teaching; curriculum innovation; partnering with corporations for campus recruitment; organizational citizenship and resource management.
4. Financial: prosper; succeed; grow; survive and maximize asset utilization.

By the time the author wrote the paper, there was no evidence of the application of BSC to the educational institutional domain in India. For this reason, the proposed scorecard aims to be flexible in such a way that it can be adapted to the requirements of different educational institutions.

II-A6. BSC for private universities in Iran : Private universities may have a different focus in terms of financial perspective in comparison to non-profit universities. The authors [24] propose a BSC for private education institutions in Iran. The scorecard includes indicators from authors who have applied them in the design of BSC for other universities. The proposed scorecard includes the following perspectives and their corresponding topics to be measured.

1. Financial: cost control, budget control, fundraising, scientific research excellence, and expanding breakthrough.
2. Customer: product quality, student satisfaction, academic excellence, service to the university, and brand.
3. Internal process: customized courses, operational business process, teaching quality evaluation, currency of faculty and classroom material/experiences, quality faculty and engaging the world beyond the campus.
4. Learning and growth: faculty development, teaching/learning innovations, adequate physical facilities, establish a broad-based and continuous strategic planning process, investment and information infrastructure.

The fact the university is private influences in the scorecard design where the financial perspective becomes more relevant than other scorecards for non-profit institutions where the customer perspective is ranked in the first place.

II-A7. BSC for private universities in Jordan: University performance plays a key role in a globalized economic and competitive market where the allocation of limited resources, quality assurance, and management define advantages competencies. The study performed by [1] identifies the importance of Jordanian Private Universities of a performance evaluation using the BSC framework. The collected data from 130 questionnaires showed that universities recognize the BSC as a strategic tool to assess, improve performance, and rationalize decisions. Results also show the importance of training programs for employees to develop the skills required to apply the scorecard.

II-B. Assessment of existing works

The analysis of the BSC adopted by universities from different countries around the world will be presented from

two standpoints. The main goal is to identify what are the drivers and topics of interest explained in the research works previously presented.

Firstly, it is introduced an analysis of the terms used by higher education institutions in the statement of strategic objectives included in their BSC. This assessment aims to identify what are the key drivers in higher education institutions based on their strategic objective definition.

Secondly, it is described the mission statements of worldwide ranked universities. The aim of this review is to highlight what are the issues of interest of institutions that motivated them to measure its performance using a BSC.

II-B1. Key drivers in strategy definition: The analyzed scientific works describe the strategic goals included in their BSC designs. These terms were analyzed with the purpose of identifying the key drivers of performance measurement in higher education institutions. Figure 1 shows a word cloud generated by a web application[2] using as input strategic objectives of HEIs analyzed in this chapter.

Results show the importance of *students* as the main customer in educational institutions. The high frequency indicates that numerous strategic objectives are involved mainly with student issues. Institutions are focused on *students* as main customer and they are oriented to *quality* probably motivated by the existence of accreditation agencies or by the need to compete in international rankings.

Figura 1: Terms employed in BSC strategic objective's statements.

Development is another issue that concerns institutions may be as a competitive strategy as the term *new* suggests. It is clear a *service* orientation of institutions which implies a need to interact with the environment. *Teaching* play an important role in the institution's performance. *Increase* and *improve* are expected effects in many aspects of institutions and they are linked with existent capabilities.

II-B2. Mission statements of worldwide ranked HEIs : Similar to the strategic objectives presented in the scientific literature, the mission statements of HEIs worldwide reveal common aims and directions. To identify aspects included in their purpose declaration of different HEIs the mission statement from universities include in the top 10 a global ranking[3] were analyzed. To avoid a bias analysis the statement of other universities not ranked from different countries was included.

Figure 2 shows a word cloud generated by a web application[4] using the HEIs mission statements mentioned before. The terms with higher frequency were taken into account at the moment of defining the strategic objectives. In this sense, it is feasible to state that HEIs aims to focus on *society*, *research*, *educate*, and *knowledge* where *research* plays a key role and interaction with *society* is required.

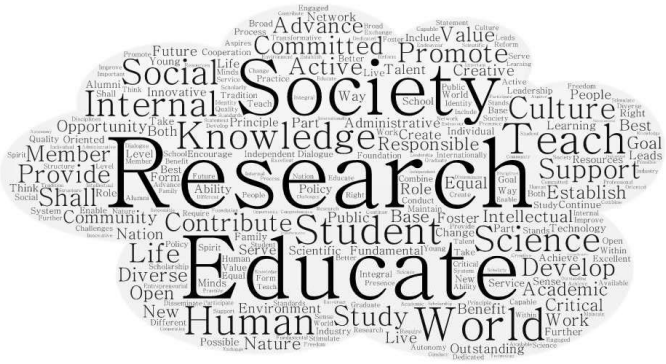

Figura 2: Word clouds based on keywords used by HEIs in their mission statements.

III. The Strategy Map for HEIs

The Balanced Scorecard framework has been widely utilized for strategy and performance management in the industry and then in the education sector. This section presents the application of this framework to design a strategy map for EdTech in HEIs. The main drivers for the strategy definition are: *the maximization of benefits of EdTech in education* as well as *an efficient resource utilization* that can help HEIs to improve its performance during and after this pandemic.

It is important to highlight that Educational technology includes different platforms, tools and software, which vary according to each institutions' resources. To avoid a biased in the strategy map design, we consider the LMS and equipment to produce multimedia for teaching purpose as the main components of the EdTech ecosystem. We assume that most argentine HEIs in some way have implement both components. For this reason, the strategic objectives are explained around these platforms.

The strategic map assembles the concepts and ideas that can be summarized in the following paragraph.

[2]https://wordart.com/

[3]https://www.topuniversities.com/university-rankings/world-university-rankings/2020

[4]https://wordart.com/

"Higher education institutions have invested significant and valuable resources in the deployment of educational technology to improve student's learning experience. The COVID-19 pandemic acelerated the adoption of EdTech in education providing an opportunity not only to improve the educative process but also to improve long term cost structure by maximizing the benefits of EdTech".

The benefits of using EdTech in the educative process can be tangible and intangible. Tangible are related to the improvement in cost structure. The list of intangible benefits are direct or inderectly linked to the strategic objetives such as enhance the learning experience, strengthen the institution image, expand the boundaries to the e-learning market, improve student performance, and develop the educative community skills. Additionally, it is possible to mention that the institution will improve their social responsibility actions, will develop new research areas, among other advantages.

Argentine started a quarantine in march 2020 and the educational system was forced to rely on technology to continue educating from home. This situation unveiled the underutilization of technological resources by most HEIs where the LMS gain a predominant role as well as the need to record videos for the lectures. This unexpected situation demonstrated the capability of the educative community to teach and learn most of subjects independently of the institutional buildings. Naturally, there are field activities required in certain carreers that cannot be replaced by virtual meetings.

Figure 3 presents the strategic map for EdTech in higher education institutions.

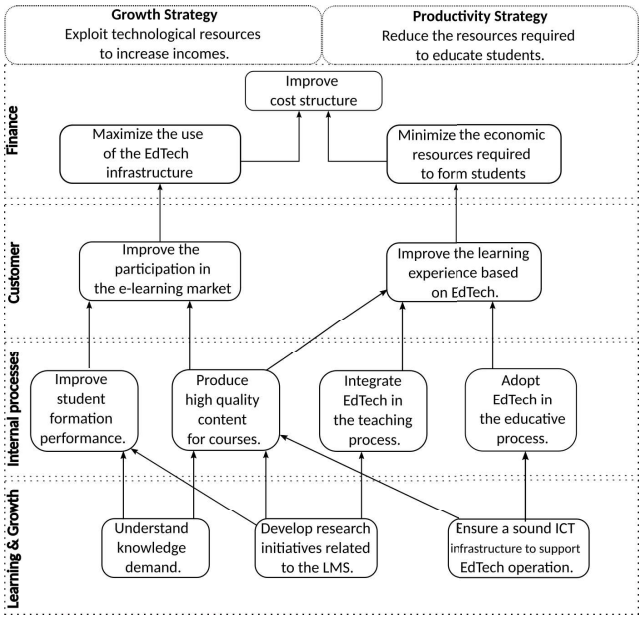

Figura 3: Strategic map for EdTech in HEI.

The strategic map encompasses twelve strategic objectives distribute through the four perspectives suggested by [10]. These authors suggest for public organizations to switch the financial and customer. However, the proposed design keeps the original perspectives because it focuses on the cost structure. The adoption of tools from the business world should not rise misunderstandings about the right to free access to public HEIs services. For a better understanding of the strategic map design, the four perspectives are described from subsections III-C to III-F.

The strategic map shows two branches, the one at the left is related to a revenue growth strategy and the one on the right side is about a productivity strategy.

III-A. The revenue growth strategy

HEIs have multiple resources to expand the limits of education beyond their building boundaries. These resources include knowledge, research capabilities, professors, know-how, educational specialists, and technology for educational purposes.

According to the BSC framework, the strategic map links objectives based on certain expected cause and effects. The relationships among objectives are presented next:

1. If we understand knowledge demand and develop research initiatives related to EdTech, then we will improve student formation performance and we will produce high-quality content for courses.
2. If student performance improves and we produce high-quality content for courses, then we will improve our participation in the e-learning market.
3. If our participation in the e-learning market improves, then we will maximize the usage of the EdTech infrastructure.
4. If we maximize the use of the EdTech infrastructure, then we will improve the institution cost structure.

The revenue growth strategy aims to make maximum usage of HEIs resources to obtain financial resources that contribute to improve the institution's cost structure.

III-B. The productivity strategy

Nowadays, most people around the world have diverse portable electronic devices connected to the Internet wherewith they can access a wide range of services. The COVID-19 pandemic started in 2020 showed that it is feasible to move the educational boundaries beyond buildings. The lockdown experienced by citizens of many countries demonstrated the education independency of most of the institutional physical assets not including the technology environment.

The cause and effect relationships for this strategy are outlined next:

1. If we develop research initiatives related to EdTech and we ensure a sound IT infrastructure to support EdTech operation, then we will integrate EdTech in the teaching process and we will adopt it in the education process.
2. If we integrate EdTech in the teaching process and we adopt EdTech in the education process, then we will improve the learning experience based on EdTech.

3. If we improve the learning experience based on EdTech, then we will minimize the economic resources required to form students.
4. If we minimize the economic resources required to form students, then we will improve the institution cost structure.

The productivity strategy relies on the improvement of asset utilization leading to HEIs to improve their structure cost.

III-C. Learning and Growth Perspective

The capabilities of HEIs for learning and growth will lead institutions to meet internal processes, customer, and financial objectives. Bearing this aspect in mind the perspective includes the following three strategic objectives: i) understand knowledge demand, ii) develop research initiatives based on EdTech, and iii) ensure a sound ICT infrastructure to support EdTech operation.

The interaction with different actors from society will help HEIs to understand knowledge demand. Understanding the environment from which an HEIs are a part of as well as the development of research initiatives will provide inputs to the institution for learning and growth in different aspects outlined in the strategic map. To this end, it is important to guarantee a sound ICT infrastructure. The following subsections present a more detailed explanation of each strategic objective.

III-C1. Understand knowledge demand: The main functions of HEIs are the formation of students in different careers, the management and creation of knowledge, the development of researchers, the design of innovative solutions to specific problems, the formation of the general public through specific courses, the implementation of different actions related to social responsibilities, among others. Although most of the processes involved in these functions occur within the institution, HEIs can not function isolated from society.

A modern society organization is based on groups who play different roles in pursuit of the common welfare. In general, these groups are government and its network of agencies, companies, non-profit organizations, associations, and unions with different purposes, among others. The activities performed by these actors and their interaction generate different demands linked to HEIs functions.

The deployment of new technologies and new businesses or the internationalization of companies generates new requirements about skills, knowledge, and background that students must fulfill when they graduate. These requirements can emerge from different actors in the public or private sector from a society.

HEIs can respond to these new requirements by the development of different initiatives. The institution can upgrade the curricula of their careers based on these new needs. They can dictate new courses oriented to address specific knowledge demands. They can design new post grade degrees or develop new research projects. In this sense, social actors can directly or indirectly state demands for new professions or orientation within certain careers.

The government in its role of looking for the social common welfare can identify social demands throughout specific agencies. Part of these demands can be addressed by an HEI in collaboration with certain agencies. For example, a person who belongs to vulnerable social groups could participate in programs with specific formation goals designed by an HEI and the government. This type of initiative can develop different skills that help people to participate in the labor market or start their entrepreneurship.

The interaction between society and an HEI can lead to extensive analysis and discussion. The common aspects of the topics outlined in previous paragraphs are knowledge and the role of HEIs as its custodian. This subsection limited the analysis to topics related to EdTech. These infrastructures can be used as important mechanisms to respond to knowledge demands. In this sense, EdTech not only acts as a means of access to knowledge but also as a repository of data. Open access to knowledge to different social actors brings up the opportunity to collect data based on their interaction within a learning context. These data are valuable assets for HEIs not only for research but also for reporting and understanding knowledge demands.

III-C2. Develop research initiatives based on the LMS: A LMS is a key component of EdTech that keeps track of numerous actions and activities performed by students, professors, and administrators. This information is stored by the system in a portable format log files that can be imported to any database for further analysis. The platform records data about user interaction with certain content and tools through the LMS. This information can help to identify the resources utilized by users, when they use them, how long they interact with the platform, the time frame they use the system, among other activities.

The platform provides a virtual environment where users can interact generating valuable data about social networks, common doubts about certain topics, frequent questions about a determined subject, quality of assistance, and support provided by professors, among others. Additionally, the LMS provides the functionalities to keep track of user performance in terms of activities completed, assignments development, results of quizzes, and evaluations.

The data provided by an LMS can be a starting point to develop research initiatives that contribute to improving different processes. Two processes intrinsically related to an LMS are the student performance and the quality of e-learning courses.

A research initiative could be focused on the development of a monitoring mechanism to observe student behavior based on the digital fingerprint recorded by the platform. Although this information can be incomplete or it can provide a biased perspective about student performance it could help professors and pedagogical specialists to identify the student behaviour.

Collaborative work between professors and specialists in education could help to identify the strengths and weaknesses of each student and their learning styles. Through this continuous monitoring, professors could provide the resources

needed by the student. This personalized assistance and customization of the learning process could contribute to improving the overall student performance.

Based on continuous use of the LMS by students in the learning process, it is feasible to assume that the platform will generate enough data to identify learning patterns of student groups determined by age, backgrounds, historical marks, social networks, Etnia, among others. This information can by used by a research initiative to identify features that contribute to improving the design of e-learning content. For example, course duration, evaluation styles, level of detail of the topics included in the course, organization, schedule, among other attributes. This research endeavor could help to increase the quality of the course.

III-C3. Ensure a sound ICT infrastructure to support EdTech operation : ICT infrastructure supports numerous processes in HEI and the deployment of EdTech will consume more of these resources affecting the IT services performance. The ICT infrastructure encompasses a set of servers, computer clusters, data networks, operating systems, and software required by HEI. It also includes conditioned physical spaces to allocate servers, network racks, and other hardware.

Hardware and physical spaces are indispensable for the ICT operation, however, the governance of these resources plays a major role in preserving the sound and efficient functioning of this key component of the HEI. The governance relays on involves skilled experts capable to maintain upgraded resources, develop security policies, elaborate contingency plans, and envision the future infrastructure needed by the institution.

The deployment and intensive use of EdTech will demand additional technological resources that may overload the ICT infrastructure and jeopardize the quality of services of other systems in the HEI. Furthermore, low-performance ICT could hinder the deployment process of both components. For this reason, this strategic objective aims to address this situation and its definition takes into account the hardware and human factors mentioned in previous paragraphs.

The hypothesis behind this strategic objective states that a sound IT infrastructure will contribute to facilitate the adoption of EdTech in the educative process and to enable efficient production of content for courses. During the pandemic professors and students stressed the IT infrastructure like never before. In many cases, this could produce failures in EdTech operation, which can have a negative consequence in the use of EdTech by users, especially those who are not familiar with technology.

Software adoption in organizations can be a complex process when considering the human factor. Notwithstanding resistance to changes is frequent in many organizations, HEI culture could exacerbate the adoption of technology in the educative process. Educational institutions are integrated by experienced professors with diverse backgrounds who have taught specific subjects using traditional methods for years. To motivate, convince, stimulate, and lead these groups of users to adopt EdTech in the education process is a burdensome endeavor.

Considering the challenge of adopting EdTech by the community of an HEI it is important to focus on the ICT soundness. The role of this infrastructure in the adoption process is to guarantee an efficient operation of the resources required by the platform to work properly. If the underlying technological resources do not perform properly, then this will be reflected in the EdTech adoption making it difficult for users to make a fair appraisal of these technologies performance.

Motivated and skilled ICT teams can lead HEIs to be aware of the latest advances in technology leading to the use of state of the art solutions, products, and resources. In this way, it is feasible to contribute to improving the quality of educational multimedia content. High-quality content will increase user satisfaction and motivation to consume these multimedia products. Additionally, brand new technology will also extend the product shelf life for example in e-learning markets.

III-D. Internal Process Perspective

Managers need to identify what are the critical processes at which an HEI must excel to meet customer and financial objectives. From this standpoint, this perspective encompasses the following four strategic objectives: i) adopt EdTech in the educative process, ii) integrate EdTech in the teaching process, iii) produce high-quality content for courses and iv) improve student formation performance.

Taking advantages of the experiences HEIs comunity went through the pandemic it is possible to enhance, support and improve the adoption of EdTech along with its integration in the teaching process to help HEIs to improve the educative process. Additionally, if HEIs master the internal processes of content production and student formation, then they can develop competitive capabilities to participate in the e-learning market. The strategic objectives are described in the next four subsections.

III-D1. Adopt EdTech in the educative process: The term adoption is defined by the Oxford English dictionary as ”the action or fact of choosing to take up, follow, or use something”. In computing adopting a software, platform or technology is more than just deploying the hardware, installing the files and training users [7].

It is important to highlight the differences between this objective and the objective that aims to integrate EdTech in the teaching process in the context of this work. For example, to integrate the LMS in the teaching process refers to a more complex process where pedagogical aspects are involved in terms of the methodology required to fully exploit the process of teaching using an LMS. This strategic objective is presented in the next subsection.

To adopt EdTech implies the development of technical knowledge needed to use all the features of technologies such as a LMS. In this sense, the system users include professors, specialists in education, managers, students, administrative and support staff. This could be a phase achieved by most HEIs

where they have installed an LMS, train their users, and then professors and students use the platform mainly for content management.

The adoption of the LMS in the HEI community requires the full support of the board of trustees to facilitate the implementation of different programs. It is also important for the manager's commitment to performing the required action to achieve this objective. In this sense, the pandemic introduced an unprecedent opportunity to adopt a LMS in the education process. However, this adoption can be negative affected if users stop using the LMS once institutions return to their functioning before the pandemic.

The two primary actors in the educative process using an LMS are professors and students. They will be the user who spends more time and use the platform especially during the development of a course. Since the platform usage can be framed within 24 hours including the seven days of the week, it is important to rely on a sound IT infrastructure.

The platform adoption must be sustained by users' motivation, engagement, training, feedback, technical support, and technological resources. Both professors and students should have received all the aforementioned resources as a start to expect they use the platform. Then, it is important to monitor their usage of the platform through the logs provided by the LMS. This information and feedback from users will improve the system adoption process.

Regarding students, it is important to consider potential groups who can not access or have technological resources such as the Internet, laptops, tablets, or personal computers. In this case, it is possible to implement programs to support these groups by lending the required resources.

The adoption of EdTech such as a LMS requires a coordinated effort from managers, professors, students, and IT staff to work together for creating a collaborative environment. Successful adoption of EdTech should contribute to achieving the strategic objective of improvement of the learning experience.

III-D2. Integrate EdTech in the teaching process: The integration of an LMS along with other technology to support the teaching process is beyond the technical skills required by professors to use these technologies. This strategic objective plays a key role to make a difference in comparison to some institutions that use an LMS as a cloud repository of documents or as a tool to distribute content for lectures.

Integrating EdTech in the teaching process implies to work on complex multidisciplinary subjects where most of them are probably related to pedagogical aspects. In general, every professor adopts a position on how technology should be used in their lectures and courses. This is could be the most controversial point that should be addressed by team works and open debates.

Professors should decide on what material makes it available using EdTech, the format of such material, a schedule for students to follow, activities to complete, supplementary resources, evaluation format, expected skills to be developed, among others. For some subjects, all these decisions were made through several years based on experience and results. For this reason, integrating EdTech in the teaching process could be one of the most challenging strategic objectives for an educational institution.

Migrating a subject based on the traditional teaching process let's say analog courses to fully digital courses available in an LMS is not an easy task. Professors may decide to record theoretical material for their lectures and make them available on the platform and work on applied cases in a face to face lectures. Selecting the content must consider parameters such as how the content is fragmented in videos, its duration, the profile of the student who will learn from those videos, learning styles, visual design aspects, among other variables.

Considering the arguments presented before the integration of EdTech can be a long term complex process that requires a multidisciplinary work in teams. However, educational institutions are motivated to produce digital content for their courses as a competitive strategy especially taking into account how technology is part of the life of a new generation of students. In this way, the success of this strategic objective can contribute to improving the learning experience based on EdTech.

III-D3. Produce high quality content for courses: Technological advances have led HEIs to acquire equipment and software to produce multimedia content for educational purposes. An institution can organize these resources into a multimedia studio including multidisciplinary experts. The produced content can be part of different types of courses including subjects in the curricula of a career, general course for the public, Massive Open Online Course (MOOC), specific training for employees in companies or government, among others.

Probably some HEIs invest diverse resources to install a multimedia studio with the expectation of modernizing their educative process. However, there could be a significant difference between the expectations about the use of these resources by professors to create content for their lectures and their real utilization. This situation can lead to an underutilization of resources, which potentially can help HEIs to develop their educational capabilities.

Based on the hypothesis of resource underutilization this objective is intended to motivate an HEI to improve their educational quality by the use of their multimedia studio. Firstly, the studio can produce content for internal and external customers. Secondly, the institution can provide service to produce content for other organizations. Thirdly, the multidisciplinary team that is part of the studio can provide consultant services.

To maximize the utilization of the HEI resources to produce high-quality content with the educational purpose it is important to achieve the following three strategic objectives: i) understand knowledge demands, ii) develop research initiatives related to the LMS, and iii) ensure a sound IT infrastructure.

Understanding knowledge demands can contribute to identifying what type of courses, training, and content are

required by different social actors and what updates should be applied to the HEI curricula. HEIs have the key assets to produce high-quality content including technological and human resources. Technological resources include the equipment to create digital content as well as the platform for its management and delivery. Moreover, an HEI has experienced professors from diverse backgrounds, specialists in education, the know-how on the education process, researchers, reputation, and image.

Scientific research based on data collected by an LMS where the courses produced are accessed can contribute to improving the quality of content. The data can help to identify learning styles, the efficiency of videos to teach content, users' feedback and opinions, common mistakes, and doubts, among others. All these factors along with state of the art methodology from scientific results can lead an HEI to produce high-quality educational products.

A sound ICT infrastructure is crucial to orchestrate all technological available resources in an HEIs to maximize their utilization. The consequences of low performance or failures in this infrastructure can affect internal and external customer satisfaction. Users can ascribe a low quality of services or courses resulting from misfunctions in the ICT infrastructure. A user misperception or misappraisal of a product can demand a significant effort to change it.

These three aspects contribute to achieving this strategic objective and they also influence the expected output from producing high-quality content for courses. This content can help HEIs to enter the e-learning market based on high-quality products. Additionally, the efforts to improve content quality can make the learning process a better experience leading to an improvement of internal customer satisfaction.

III-D4. Improve student formation performance: In the context of this thesis, the performance of student formation is related to the developed skill, capabilities, and knowledge wherewith students finish different courses in HEIs. During a career, every course contributes to forming students according to a set of competences included in the curricula of a certain career.

The performance of student formation is one of the different attributes that depicts the quality of education provided by an institution. This performance can be analyzed through several aspects including the average marks obtained during a career and the average time required to graduate. Other aspects that can also be considered are the number of students who obtain a postgrad degree, the number of graduates who are part of the scientific community, the number of graduates that occupy critical positions in important organizations, and the number of students awarded.

HEIs are interested in improving student performance for different reasons. The role of students in society indirectly communicates the results of certain educational institutions contributing to improving its image. Sustained improvement of student performance along the time create prestige and reputation. These features can help to compete for resources, attract companies to develop joint venture projects, motivate organizations or particulars to request consultancy services, software development, customized training, or courses, among others.

Improving student performance formation is linked with two strategic objectives called understand knowledge demand and develop research initiatives based on the LMS. Additionally, the results of this strategic objective have an impact on improving the participation of an HEI in the e-learning market.

Understanding knowledge demand provides HEIs with information to identify the new skills required by graduates to compete in the labor market. It also helps to discover new capabilities that students should develop to facilitate access to key positions in companies. Additionally, it is feasible to identify hot topics that should be addressed during student formation. Continuous monitoring of social actors' interactions, their knowledge demands, and their needs can help HEIs to comprehend the environment where students will work. Thus, it is feasible to keep updated curricula to improve student performance which contributes to enhancing the image and prestige of an institution.

Scientific research initiatives based on data collected by an LMS can provide results for a better understanding of the effects of learning using this platform. In this way, it is feasible to adapt the educative process to improve the students' marks and the time required to finish their courses. In this sense, a critical factor to observe is the quality of student formation with the aims of improving their performance.

The interaction of HEIs with society to monitor and keep track of changes, requirements and needs facilitate the formation of highly qualified students. Scientific research can improve the learning process leading to an improvement in the learning processes. The desired effect of these strategic objectives is to enhance the overall image and position of an HEI in society to facilitate the penetration and participation in the e-learning market.

III-E. Customer Perspective

Formulating the customer perspective implies a clear understanding of targeted customers and business segments. To this end, this perspective includes two strategic objectives, improving participation in the e-learning market and improving the learning experience based on EdTech.

There are two targeted customers included in this perspective, students from different careers dictated by an institution and diverse customers from e-learning markets. In this sense, this perspective aims to address issues related to internal and external customers. The next subsections provide a more detailed explanation about the strategic objectives included in this perspective.

III-E1. Improve participation in the e-learning market: HEIs have valuable resources to design, produce, and distribute diverse products to offer in the e-learning market. Firstly, educational institutions gather professionals from different disciplines and backgrounds, experts in pedagogy, technical staff, multimedia designers who can contribute to design and produce diverse content for e-learning. Secondly, institutions

have research capabilities to produce cutting-edge content for courses. Finally, they have an ICT infrastructure including an LMS and multimedia studio to provide e-learning services.

Human resources, know-how, research capabilities, and technological infrastructure provides HEIs with the key components to participate in the e-learning market. This strategic objective is related to the production of high-quality content as a competitive advantage to penetrate the market. In this sense, the institution image can also play a key role to gain competitive advantage in this market.

The institution image can be created through time based on the performance of graduates in different areas of society. For this reason, an improvement in student formation performance can contribute to enhancing the HEI prestige, reputation, image as well as the evaluation made by accreditation agencies and the institution position in rankings. All these factors contribute to developing strategic advantages to participate and compete in the e-learning market.

Along with a good reputation providing high-quality content can lead institutions to gain, keep, and engage customers. Since producing high-quality content is a strategic objective its success can strengthen the institution's competitive capabilities. Part of the produced content can be included as social responsibility actions by providing training to vulnerable social groups. This initiative not only contributes to the social common welfare but also enhances society's perception of the institution.

Participating in the e-learning market has different benefits such as reaching students beyond geographical boundaries, publicize institution services, programs, and products, attract investors, sponsors, and finally but not least to increase the HEI financial resources. This could create a virtuous circle where financial resources can help to expand the institution to participate in the market increasing its incomes.

Entering the e-learning market along with understanding knowledge demands an HEI can identify who are the key actors in society, what skills are needed in the labor market, and what are the hot topics where the formation is required. This information can be important to gain a better understanding of the e-learning market and to improve educational internal processes.

The expected effect of achieving this strategic objective is to maximize the usage of EdTech leading the HEI to an improvement in their cost structure.

III-E2. Improve the learning experience based on EdTech: The learning experience is related to the student feelings and sensations caused by the learning process. Different environmental and human factors can influence how every student experiences the learning process. The environmental conditions involve the place where the learning occurs for example classrooms, libraries, laboratories, home, outdoors or a mixture of them. The human factor involves the characteristics of the persons who participate in the learning experience such as professors, assistants, tutors, classmates, advisors, mentors, among others.

An LMS is a powerful tool to improve the learning experience throughout services that are intended to facilitate the learning process. To benefits from this tool services, it is important to adopt EdTech in the educative community and to integrate EdTech in the teaching process. For example, the adoption of the LMS involves the development of technical skills to properly use all available features provided by the platform and the integration of the LMS in the teaching process is a complex process of designing courses based on the LMS.

Besides these two requirements, the use of high-quality content in courses plays an important role in the learning experience. State of the art methodologies can help to produce content that makes the learning process an enjoyable experience. In this sense, design aspects such as easy to understand explanations, practical examples, short but accurate learning sessions, and updated content. Additionally, it can also help to improve the experience to define interactive activities, work in teams, to set adequate goal settings and schedule, to provide fluid communication with professors, offer personalized assistance and customize additional content if necessary.

Thus, adopting EdTech in the educative community, integrating EdTech in the teaching process, and producing high-quality content can, directly and indirectly, contribute to improving the learning experience. The expected effect of this strategic objective is to encourage the development of learning experiences as most independent as possible from classrooms. If an institution motivates students to learn outside the institution's physical boundaries, then it is feasible to minimize the economic resources required to form students.

III-F. Financial Perspective

For most organizations, financial objectives are long-term goals based on the results of different processes and initiatives. In the case of public HEIs, the financial perspective aims to increase the efficiency of their financial resource and assets utilization without affecting the educative process quality.

This perspective involves three strategic objectives starting with minimizing the economic resources required to form students, followed by maximizing the usage of EdTech to finally improve the institution cost structure. The following subsections describe in detail the three strategic objectives linked to this perspective.

III-F1. Minimize the economic resources required to form students: Nowadays, advances in technology are transforming diverse human activities by fusing electronic devices with different processes. We are progressively using more and more gadgets not only in our daily work but also in our time to spare. Since these gadgets operate over the Internet, we have provided our environments with this communication service.

In a highly connected world where we live, EdTech can facilitate the learning process by providing access to lectures of courses anytime and anywhere. To this end, it is important to produce high-quality content to fulfill

students' expectations. Besides, the educative community should have adopted EdTech to take advantage of its services. Additionally, these technologies should have been integrated into the teaching process to increase the offer of courses based on this modality.

If these conditions are met then it is feasible to motivate students to develop a learning autonomy that helps them to optimize the development of the competencies required by a career, courses, or training programs. This initiative does not imply isolated learning where the HEI does not participate. On the contrary, the institution should carefully follow this type of learning to guarantee a successful result.

Additionally, an HEI provides a social environment that enriches the social skills of students. In this sense, it is important to find a balance of the time spent in classrooms, laboratories, libraries, or other places within the institution. This can lead the institution to rethink the use of resources such as time and classrooms in the learning process. On the basis that students can learn anytime and anywhere, it is feasible for the institution to redefine the economic resources required to form students and improve its cost structure.

III-F2. Maximize the use of the EdTech infrastructure: HEI around the world invest diverse resources to implement EdTech but usually, they use the platform as a cloud service to store different type of files customarily the lecture notes of the subjects of a career. They also acquire and install specific equipment to produce multimedia material to complement lecture notes. This strategic objective is defined based on the assumption that an HEI has an LMS and a multimedia studio underutilized for diverse reasons. The COVID-19 pandemic pushed educators and students to rely on technology to continue with the education process. For this reason, HEIs have the opportunity to continuing with this initiative and benefits from its adoption and deployment.

In the first place, motivating professors to continuing using EdTech in their lectures and classroom activities is a complex process. On the one hand, professors may not agree with changing the methodology used for years to teach. On the other hand, they might have no time, and in most cases the technical skills to use EdTech.

In the second place, the institution must deal with the acquisition of equipment to support EdTech, the physical place where to install the hardware it requires, the definition of security protocols, the recruitment of technical specialists to set and tune the technological infrastructure, the definition of training programs, among other issues.

In third place, if the key stakeholders visualize the potential use of the infrastructure in the long term run, then all effort will be limited to install all the equipment and make basic use of the infrastructure.

Finally but not less important, it seems there is an important antagonism in public universities between the principle of free access to education as a social commitment and the university as a business actor in society. A business-oriented vision in universities can foster new ways to make business exploiting their soft and hard assets to increase their incomes. These reasons motivate the definition of the strategic objective of maximizing the usage of EdTech. Considering the investment made by institutions it is an important opportunity to exploit the available resources throughout new creative and diverse ways.

HEIs have all the required raw materials to provide rented services to different customers. It is possible to create training programs, digital courses, certifications, and degrees based on online or blended teaching. The institutions also have the infrastructure to provide multimedia services to companies, governments, and other organizations. They have the know-how about the infrastructure deployment and consulting services that can be offered to other educational institutions or companies. The maximization of technological infrastructure usage can contribute to improving the cost structure of the institution.

III-F3. Improve cost structure: The main driver to define this strategic objective is the availability of underutilized EdTech that have demanded the investment of a significant amount of resources by HEIs. Along the strategic map have been defined as a set of strategic objectives that contributes to improving the institution's cost structure.

The EdTech infrastructure can be a crucial strategical asset to foster the growth of an HEI. The maximization utilization of this infrastructure can lead to an increment of incomes based on the development of new products and services. In this sense, it is necessary to rethink the institution not only as a key social actor but also as a business player.

The minimization of the economic resources required to form students can be a side effect of exploiting EdTech in times when technology is a pervasive and ubiquitous agent of changes. If students succeed in learning outside the institution's physical boundaries then it is possible to improve the assets utilization such as classrooms, electricity, heating, and cooling systems among others.

IV. Conclusions

Higher education institutions (HEI) have invested diverse resources to gradually deploy a hardware and software components to improve the performance of different processes. Thus, institutions create an ecosystem composed of systems to manage their resources, assets, student relationships, lecture content, scientific production, digital content, among others. The educational technology infrastructure is a key component of this ecosystem because its usage can transform the educative process.

A growing number of HEI have implemented from homegrown to proprietary or open-source LMS. Nowadays, there are different open source LMS such as Moodle that has been successfully deployed in many institutions around the world. Along with an LMS numerous HEI acquire specific equipment to produce educational multimedia material to modernize the educative process. The combination of both components along with other hardware, software and gadget are part of EdTech.

Before the pandemic deploying EdTech not only seemed necessary according to the times we live but also it looked like a simpler process than it really is. The availability of open-source free platforms seems to contribute to this oversimplified appraisal. Additionally, the acquisition of equipments to install a multimedia studio looks like a reasonable complement of an LMS. A multimedia studio should be utilized to produce educational material and the LMS should operate as a distribution channel to deliver students the resources needed to improve their learning process.

Changes introduced by the COVID-19 pandemic acelerated the adoption and deployment of EdTech in the education process. This process was not planned in advanced forcing the educational community to improvise decisions and strategies to continuing with the education process. In a post pandemic era it is possible to take advantages of the lessons learnt in extreme situations like a lockdown.

Improving the adoption of EdTech as key components of an HEI requires diverse resources such as time, equipments, technical specialist, physical space, maintenance team, additional electricity supply, air conditioning for servers, security policy design, among others. The risk of deploying both components without a strategic plan is twofold. On the one hand, the institution will invest a large number of resources in the adoption process and it will not be clear what are the benefits of such investment or the impact of these components in the educative process.

Frequently, institutions make an effort to modernize their educative process by including educational technology but sometimes the results are not as good as expected. Some institutions deploy an LMS and a multimedia studio and they underutilize these resources. The LMS becomes a repository for material used by professors in their lectures making this platform no difference with respect to any cloud service. The multimedia studio may attract some enthusiastic professors who want to create videos for their lectures but most of the time these resources are underutilized.

The investment made by HEI in EdTech can transform the institution's educative process as well as create new opportunities to optimize the use of assets and know-how. This endeavor can be a long term complex process that involves several steps to carry out. The starting point is the definition of objectives to fulfill and a set of actions to reach those objectives. It is required a mechanism to measure the effects of actions towards the objective achievement and efficient resource management to provide the inputs required to obtained the desired results.

This work presented the application of the Balanced Scorecard (BSC) framework to create an strategic map to maximize the benefits of EdTech in HEIs taking advantages of the experiences that took place during the pandemic. The literature review shows how the Balanced Scorecard framework has been used with diverse purposes in HEI.

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