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Research Paper

Facilitating Change Management of Higher Education Institutions by Integrating Artificial Intelligence Tools in their Balanced Scorecards

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ABSTRACT
This paper illustrates that the application of artificial intelligence tools to forecast the measures of the Balanced Scorecard is essential for improving the efficacy of decision-making concerning change management processes within Higher Education Institutions. These Institutions are required to continuously adjust to the evolving circumstances of the dynamic environment in which they operate. Concurrently, Higher Education Institutions must adhere to the diverse and numerous demands of all their stakeholders. Developing a hybrid technology that incorporates innovative technologies and assists executives in making informed and effective decisions is deemed especially essential.

KEYWORDS: *Change Management; Balanced Scorecard; Artificial Intelligence*

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I. INTRODUCTION

The environment in which all modern organizations operate is extremely complex and volatile. Nowadays, an organization must adapt with immense speed and flexibility to the changes that take place in its internal and external environment (Kotter, 1998). Change management is a structured approach that facilitates the smooth transition of an organization from a current state to another desired one, maximizing the positive benefits resulting upon the completion of this transition (Chytiris, 2001). At the same time, it provides the appropriate tools and techniques in case it is detected that the course of the organization deviates from the initial goals that have been set.

In particular, the implementation of changes in Higher Education Institutions is a very laborious and demanding process due to their multidimensional structure and their multifaceted mission. However, they must remain constantly in tune with the needs of all their stakeholders. Therefore, in the effort of their continuous reform, the application of modern tools and techniques is required, with the ultimate goal of optimally utilizing their resources, providing a high level of education to their students, and fulfilling their mission to society as a whole.

One such modern tool that contributes to both effective change management and organizational performance monitoring is the Balanced Scorecard. The Balanced Scorecard presents a methodological framework that facilitates the adaptation process in modern businesses. It equips executives and decision makers with tools and techniques to discern ways to effectively manage intricate change processes. The value system of Balanced Scorecard is designed to offer a holistic perspective of business success through a set of measurements in predefined key areas. At its core the Balanced Scorecard links the vision and the strategy of the organization with its four perspectives: a) Financial, b) Customers, c) Internal Processes, d) Learning and Innovation (Kaplan & Norton, 1996).

The Balanced Scorecard can certainly be applied to monitor the performance of Higher Education Institutions, which are by their specific nature, both producers and consumers of knowledge. Especially, when it is noticed that the course of achieving their goals deviates from the original plan, decisions must be made to implement corrective actions. Such actions for example are the reallocation of resources or the improvement of knowledge and skills of the human capital. The complexity of the problems faced by modern Higher Education Institutions makes such decisions extremely time-consuming as the amount of data to be processed by the decision-makers is vast. Therefore, effective decision-making is challenging without sophisticated models that go beyond the capabilities of traditional linear models. Moreover, an innovative strategy that has a significant

impact on the internal functioning of Higher Education Institutions is mandatory because of their social function.

This paper aims to provide evidence that the integration of artificial intelligence tools into this process significantly contributes to improving the effectiveness of the decisions made. Specifically, it investigates the adoption of artificial intelligence tools to predict the indicators that are used to measure the performance of a Higher Education Institution through the Balanced Scorecard. Therefore, this study discusses a hybrid methodology that supports the executives who manage changes in these particular Institutions. Other scholars have also proposed methodologies that combine the Balanced Scorecard and artificial intelligence, for instance, Gu et al., (2009) evaluated the performance of several companies using a similar methodology, without however relating the application of these techniques to change management. The contribution of the proposed methodology is that it utilizes both the Balanced Scorecard and artificial intelligence tools to predict the necessary changes that must be implemented in a Higher Education Institution.

II. RATIONALE OF THE STUDY

During the development of an organization's change management strategy is crucial for the pertinent executives to possess significant and reliable information. The challenges encountered by contemporary organizations are intricate, rendering the decision-making process highly time-consuming due to the vast quantities of data at hand. Artificial intelligence systems encompass a range of analytical methods, tools, and techniques that facilitate the real-time processing of extensive data sets. These predictive models can support the administrators of Higher Education Institutions in making well-informed, data-driven decisions regarding both academic and administrative issues.

III. LITERATURE REVIEW

3.1 Change Management

One of the most dominant issues that concern management science is the processes that must be followed for a change to take place. Until the 1980s, many companies were able to achieve profitability by exploiting the capital intensity that enabled them to take advantage of the benefits which arose in an aftermath of the industrial revolution. Therefore, capital intensity and technology were the most important ingredients of success. However, in the late 1980s the concept of information was introduced, and marked an entire era. Information that turns into knowledge made capital intensity and technological improvement insufficient to create a competitive advantage. The speed with which information is transferred globally in a very short time radically changes the fundamental principles on which the structure and operation of organizations at the international level are based.

Many scholars have been concerned with the issue related to whether change as a process can be limited in time as a situation that is distinguished by a beginning and an end or it is an endless process. In previous decades, the prevailing view was that business environments are linear and that past performance was a strong indicator of future performance. Thus, the prevailing perception was that only a crisis or a powerful unstable factor could initiate a major change in an organization. In this way, the change management actually signaled the beginning of dealing with a crisis or a strong volatile factor. Therefore, the introduction of changes by the relevant consultants was simply aimed at limiting the negative effects that an upcoming crisis might have on the organization. The realization that the environment in which organizations operate is non-linear created a totally different perception of dealing with change (Levy, 1994). Linear correlations of indicators which were derived in non-linear environments and systems, ultimately did not offer the intended benefit in terms of supporting management decisions (Salmon et al., 2019).

Taking into account the above, change is defined as the definitive and complete transition from one state to another. Change management is an ongoing process for an organization, which is essential for its survival. The theoretical framework of change management provides several models for handling complex situations in real-world organizational problems. Systemic approaches like change management focus on identifying the individual elements that make up a system and their complex interrelationships. At the same time, they try to detect the bottlenecks that exist in their modus operandi. A deep understanding of a system's functionality makes it easier to manage it in an ever-changing and dynamic environment.

For a change to be effectively implemented, a clear plan of action must be defined based on predetermined goals. At the same time, there must be a thorough monitoring of the factors that influence the operation of the organization, which derive from its internal and external environment. These factors must be in constant balance with each other. To monitor the progress of changes it is especially important to get feedback from all available sources and to use all the appropriate tools such as the Balanced Scorecard. The decision-makers with these tools can utilize indicators that measure past and present performance of the organization but can capture its future performance as well (Psarras et al., 2020). Furthermore, they are capable of predicting the upcoming changes by exploiting all the available data and the appropriate indicators. The collection of data and

the extraction of critical key indicators are fundamental in order to identify any weaknesses and subsequently apply the necessary corrective actions.

The need to adapt to a rapidly changing environment has made change management in Higher Education Institutions a growing area of interest in recent years. In a dynamic and evolving global education market, Higher Education Institutions face both inner and outside pressures that continually compel them to change. The effective change management in these Institutions is a decisive factor for the continuous improvement of the educational, research and administrative processes, for strengthening their credibility and for enforcing their reputation. Finally, the change management in Higher Education Institutions turns into a necessity and a main impetus for their economical sustainability and living up to the different expectations of their stakeholders.

One of the key elements driving transformation within Higher Education Institutions is the emergence of new technologies, including online platforms, artificial intelligence, and the overall digitization of educational practices (Christensen & Eyring, 2011). These advancements have compelled Institutions to undergo significant changes, a process that has been accelerated by the recent global pandemic, which has further promoted the adoption of online education. The achievement of this transition relies on strong communication, effective leadership, and a reliable technological framework. Additionally, the globalization of the market and the increasing international competition for students, faculty, administrative personnel, and resources serve as crucial factors influencing changes within educational Institutions, which are becoming progressively more and more competitive. Concurrently, the diverse needs of various student demographics necessitate tailored approaches in both the development of academic programs and the learning methods. Furthermore, many publicly funded Institutions are experiencing a decline in financial support, making institutional effectiveness and accountability essential (Brennan & Naidoo, 2008).

Gonzales and Rincones (2011) in their study adopted a comprehensive strategic planning process for a Higher Education Institution that aligned academic and administrative units under a common vision for future development. Apparently, this specific change management process was guided by strong leadership and broad stakeholder engagement. On the other hand, Christensen and Eyring (2011) examined the transformation of a conventional Institution that emerged as a leader in online education by leveraging technological advancements to broaden its influence and adjust to the dynamic landscape of higher education. Similarly in this case, the essential factors for success included forward-thinking leadership and a dedication to challenging established academic frameworks.

Change management and Balanced Scorecard are closely related as both concepts play a key role in achieving organizational goals and effectively transitioning from a current state to a future desired state. Change management attempts to effectively communicate within the organization the need for change, gain acceptance of the intended change from all the stakeholders, and align their efforts to achieve the desired results. In this direction, the Balanced Scorecard can be a strong ally as a communication tool by clearly articulating the organization's strategy and suggesting the indicators that will be used to evaluate progress when implementing change. This helps stakeholders understand how the change to be implemented aligns with the organization's strategic goals.

3.2 Balanced Scorecard

In recent years the information age has created new challenges for public and private organizations, as the speed with which any kind of information is spread has made traditional management models obsolete. The early performance management models placed more emphasis on monitoring the organization’s financial indicators (Psarras et al., 2022). Since business environments started to change rapidly and become increasingly complex, it was necessary to create a more balanced approach to evaluate the performance of an organization more thoroughly (Van Looy & Shafagatova, 2016). Therefore, organizations were forced to go beyond conventional performance indicators and develop new operational indicators whose performance cannot be influenced solely by financial results (Papalexandris et al., 2005). The intangible capital of any organizations is now the determining factor for achieving competitive advantage.

In this context, Robert Kaplan and David Norton conceived the idea of creating the Balanced Scorecard which is regarded as one of the most influential strategy tools that have been developed recently. It supports the strategic planning and change management of every organization. The Balanced Scorecard provides the decision-makers with a multi-dimensional measurement system for organizational performance based on its four perspectives (Financial, Customers, Internal Processes and Learning and Innovation). One of the most important benefits of the Balanced Scorecard is that the four perspectives can be instantly connected with the organization’s strategic vision and business goals (Kaplan & Norton, 1996). This means that the organization's mission and vision is translated into a comprehensive set of performance measures which aids the decision-makers to monitor the performance according to the selected strategy (Kaplan & Norton, 1996).

The end-users of the Balanced Scorecard should initially determine the strategic objectives of the four perspectives above. These objectives should be closely interrelated with a cause-and-effect relationship, as the fulfillment of one contributes in some way to the fulfillment of another. At the next step, the strategic objectives should be connected with indicators measuring organizational performance in every area of interest. These performance indicators are related to discrete targets, which must be achieved based on a specific timetable. In the last step, corrective actions are prepared to be implemented in case there are deviations from the initial goals (Psarras et al., 2022).

The identification and the analysis of the complex relationships between the four previously mentioned perspectives is crucial to the Balanced Scorecard's implementation, as the changes that occur influence one another in a non-linear manner (Salmon et al., 2019). In each perspective, the Balanced Scorecard emphasizes both the criteria focused on what needs to be accomplished, but also the criteria focused on how it should be accomplished. In this way, balance is established between short-term and long-term goals in relation to the results and the performance factors that influence these specific results (Papalexandris et al., 2005).

As stated before, the Balanced Scorecard and change management are closely related as both concepts play a key role in achieving organizational goals and effectively transitioning from a current state to a future desired one. Change management attempts to communicate effectively within the organization the need for change and align the efforts of the stakeholders to achieve common objectives. The Balanced Scorecard can be a powerful communication tool since it clearly articulates the organization's strategy and highlights the key performance indicators that will be used to evaluate progress during the implementation of a change. Furthermore, the Balanced Scorecard can be used to monitor the impact that the changes have on the progress of individual performance indicators, ensuring also that changes are continuously aligned with strategic objectives.

The organizations that utilize the Balanced Scorecard can thoroughly examine the extent to which the strategies they implement are producing positive results. Especially, when it is implemented in Higher Education Institutions attentive customizations are necessary to address their unique mission of knowledge creation, their non-profit mission, the complex issue of measuring academic performance, and the diverse demands of their stakeholders. Higher Education Institutions prioritize their objectives differently than other organizations. In addition to their non-profit nature, they highly emphasize goals such as academic excellence, research outcomes, and their societal impact. Consequently, many researchers contend that the financial component of the Balanced Scorecard is not as central for these Institutions as it is for other types of organizations. A common adaptation of the Balanced Scorecard within Higher Education Institutions involves renaming the customer perspective to the stakeholder perspective. The stakeholders of these Institutions encompass a variety of entities, including students, academic and administrative personnel, businesses, government bodies, and the broader society.

Numerous challenges associated with the implementation of the Balanced Scorecard in Higher Education Institutions are identified in the international literature, primarily due to the intricate nature of measuring their performance compared to other organizations. Specifically, quantifying aspects such as student satisfaction, the effectiveness of teaching methods, social contributions, and the impact of research outcomes proves to be particularly challenging. Furthermore, members of the academic community often express skepticism regarding the adoption of the Balanced Scorecard, fearing an increase in administrative scrutiny over their activities and the assessment of their educational and research efforts through standardized metrics. The dominant academic culture tends to prioritize autonomy, which may conflict with the demands of various performance management systems. Additionally, Higher Education Institutions, given their multifaceted missions, cater to a diverse array of stakeholders, each possessing unique expectations and requirements. Therefore, it is crucial to tailor the Balanced Scorecard to meet the specific needs of these Institutions, thereby complicating its implementation.

To tackle the aforementioned challenges, Beard (2009) proposed an approach centered on the management of academic performance, placing significant emphasis on learning outcomes and the effectiveness of research. Furthermore, Al-Zwyalif (2017) conducted a case study on a Higher Education Institution that implemented the Balanced Scorecard highlighting that key factors for its successful execution include strong leadership and the customization of performance indicators to meet the specific requirements of these particular Institutions. Umashankar and Dutta (2007) noted that the adoption of the Balanced Scorecard in Higher Education Institutions enables the integration of various individual objectives from different stakeholders, fostering a unified vision that can be translated into actionable strategies. As Brown (2012) observed, these strategies can serve as a foundation for establishing business objectives or initiatives that incorporate measurable indicators, aimed at assessing performance enhancement and achieving overall success.

Modern organizations operate in a context of constant change to which they must adapt rapidly in order to ensure their survival. The Balanced Scorecard serves as a fundamental instrument in change management, offering solutions to various challenges that emerge throughout this evolutionary process. The integration of artificial intelligence tools into the change management process represents a significant asset for enhancing

operational efficiency. Employing advanced quantitative models, which surpass the limitations of conventional linear approaches, is essential for navigating the complexities and uncertainties inherent in today's business landscape. Artificial intelligence tools facilitate decision-making as they enable early detection of upcoming changes and the execution of suitable corrective actions.

3.3 Artificial Intelligence

The ideas surrounding artificial intelligence systems were introduced to the scientific community in the mid-twentieth century. The latest technological progress, particularly in enhancing computing power and data processing capabilities, has significantly accelerated the evolution of this particular field (Duan et al., 2019). The integration of artificial intelligence into the decision-making process represents a notable advancement in both Computer and Management Science. As mentioned before, the intricate and unpredictable nature of contemporary organizational environments necessitates that decision-makers employ advanced quantitative models that surpass the limitations of conventional linear models (Delen, 2010). This approach is essential to manage effectively the excessive variability in the data which are taken into account during decision-making. To this end, sophisticated models that can effectively identify the non-linear relationships among variables have demonstrated significant utility. Moreover, artificial intelligence tools such as data mining can be applied to analyze and fully exploit Big Data. The complexity and the volume of Big Data are such that traditional statistical and computational techniques are inadequate for its analysis (Di Vaio et al., 2022).

The process of decision-making is enhanced through the application of artificial intelligence and predictive analytics, which enable the early identification of impending changes and the implementation of suitable corrective actions (Psarras et al., 2022). Furthermore, the duration needed to analyze extensive datasets along with the likelihood of human error is diminished (Valle-Cruz et al., 2022). Numerous research efforts have demonstrated the positive outcomes of the synergies that can be achieved between humans and artificial intelligence systems. These studies have emphasized the various applications associated with the use of artificial intelligence techniques, along with the specific challenges related to their role in supporting or substituting human involvement in various processes.

In the mid-1960s, the first decision support systems appeared and became feasible due to the advent of minicomputers, timesharing operating systems, and distributed computing (Power, 2007). Later these systems incorporated artificial intelligence techniques to facilitate automated predictions in various fields. The transition towards predictive analytics and artificial intelligence has been thoroughly examined by Davenport and Harris (2007), who investigated how organizations utilize these concepts to enhance their strategic decision-making processes. For instance, the integration of artificial intelligence into decision-making processes in the finance sector has had a profound impact, especially through systems designed to detect trends and anomalies indicative of potential fraudulent activities. At the same time, the advancement of self-driving vehicles capable of functioning without human oversight, along with sophisticated traffic management systems, underscores the ability of artificial intelligence to enhance safety and efficiency within the transportation sector.

The role of artificial intelligence in decision-making processes within Higher Education Institutions has become increasingly prominent in the existing literature. Many scholars have examined a wide range of aspects on this topic including the facilitation of decision-making in both administrative and academic issues. In relation to administrative matters, artificial intelligence has the potential to enhance the student admission process by utilizing historical data to identify candidates with the highest likelihood of success (Zimmermann et al., 2019). This approach allows for a more effective evaluation of student applications, therefore the recruitment process for new students becomes more personalized, as each candidate is directed towards the academic program that best meets their unique needs. By employing predictive analytics tools, many others scholars have also assessed the resources necessary for the operation of Higher Education Institutions by analyzing historical data alongside external factors.

When it comes to academic issues, artificial intelligence enhances academic processes within Higher Education Institutions by facilitating the customization of curricula, course recommendations, and even career pathways tailored to the unique requirements of individual students. This is achieved through the examination of historical data and the academic performance of previous cohorts. Furthermore, artificial intelligence supports the real-time evaluation of student performance, enabling educators to adjust course materials and teaching strategies accordingly. By employing analytical tools and assessing various indicators related to academic achievement and student engagement, Institutions can identify students facing learning challenges early on and implement targeted support measures. Additionally, these technologies can be utilized to track mental health concerns by detecting early signs of stress or anxiety among both students and faculty.

IV. CASE STUDY

The suggested methodology presented in the present case study, employs the Balanced Scorecard as a strategic framework alongside artificial intelligence tools, such as artificial neural networks, to facilitate

decision-making concerning change management in the context of a Higher Education Institution. These Institutions function within an environment characterized by continuous change, necessitating swift adaptation to secure their ongoing viability. The Balanced Scorecard, as previously stated, is founded on the principle that assessing an organization's performance should extend beyond mere financial metrics. By providing a detailed overview of an organization's performance, it serves as an especially valuable tool when making decisions pertaining to change management.

This utility is enhanced when aided by cutting-edge technology such as artificial neural networks that simulate the functioning of the human brain in solving complex problems. Their utilization has expanded significantly in recent years, as they proficiently resolve a wide range of issues arising from diverse fields of human endeavor. A key benefit of artificial neural networks lies in their capacity for self-learning, which they achieve by continuously analyzing the input data they obtain. Through the assimilation of new information, they consistently enhance their problem-solving capabilities.

In this particular case, the available past data of the measures depicted in Figure 1, could be analyzed using artificial neural networks and predict their future values. In order to fully clarify the proposed methodology, it is considered appropriate to formulate an example from the learning and innovation perspective. One of the strategic objectives related to this perspective is to improve the academic results of students. The initiative that contributes to the achievement of this specific strategic objective is the continuous evaluation of learning methods and materials. The measure used to monitor the changes brought about by the aforementioned initiative is the results of student evaluations. Analyzing a substantial amount of historical data to forecast the values of this specific measure facilitates decision-making regarding the selection of the most suitable learning methods and materials, thereby enabling the attainment of the established target value. However, in addition to the regular evaluation of the learning methods and materials, the initiatives taken regarding the rest of the strategic objectives, also contribute to improving academic results. For instance, this specific strategic objective can be influenced by both the curriculum design and the optimal utilization of resources. This example demonstrates that the strategic objectives of the Balanced Scorecard are interconnected through a cause-and-effect relationship, whereby the achievement of one objective positively influences the attainment of another.

		COMPONENTS			
		OBJECTIVES	**MEASURES**	**TARGETS**	**INITIATIVES**
PERSPECTIVES	**FINANCIAL**	Financial sustainability	Amount of donations and endowments	8% annual increase	Develop donation and sponsorship campaigns
		Resource efficiency optimization	Resource utilization rates	> 80%	Regular reviews across departments
	CUSTOMERS/ STAKEHOLDERS	Student satisfaction	Survey results	> 85%	Establish mechanisms for gathering student feedback
		Enhance student retention	Retention rate	> 90%	Establish mentoring programs
	INTERNAL PROCESS	Optimize research quality and productivity	Publication counts and citations	10% annual increase	Increase research funding sources
		Improve curriculum design	Assessment results	> 90% of courses with positive results	Regular evaluation of the curriculum
	LEARNING & INNOVATION	Develop faculty competency	Pecentage of faculty participating in training courses	> 85%	Motivate faculty members to participate in professional development courses
		Improve academic results	Student evaluation scores	5% annual increase	Regular evaluation of learning methods and material

Figure 1. The Balanced Scorecard of a Higher Education Institution.

Taking into account all the aforementioned elements, this study proposes a methodology that utilizes the Balanced Scorecard and artificial intelligence tools within the framework of change management that a Higher Education Institution seeks to implement. It is evident from the preceding analysis that utilizing advanced artificial intelligence tools, such as artificial neural networks, enables the identification of non-linear relationships among variables originating from various perspectives of the Balanced Scorecard. This process facilitates the relevant executives by minimizing the time required to make intricate decisions.

V. CONCLUSION

Consequently, the suggested methodology can effectively leverage the outcomes of various initiatives undertaken by a Higher Education Institution and forecast the indicators pertinent to the respective dimensions of the Balanced Scorecard. It equips decision-makers of these Institutions with a comprehensive understanding of their operations and the broader context in which they function. Moreover, if any discrepancies from the established objectives be identified, it becomes feasible to undertake corrective measures on time. Thus, it can serve as a foundation for developing a pilot decision support system that enhances the decision-making process within Higher Education Institutions, thereby aiding in the improvement of their overall efficiency and effectiveness.

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