A Business Intelligence Tool Designed for Governing Sustainability

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Abstract

Computer technology and administrative procedures are used to provide business intelligence (BI), which aids in decision-making. In order to balance financial and non-financial factors as well as short- and long-term measurements, the balanced scorecard is a type of business intelligence tool for performance measurement and management control. The original balanced scorecard was modified to specifically take governance, social, environmental, and ethical issues into account. As a result, sustainability concepts may be incorporated into the organization's strategy and management. This is known as the sustainable balanced scorecard. Despite being one of the best instruments for incorporating sustainability into management, the sustainable balanced scorecard has few developed and implemented instances that can serve as reference models. In order to address this issue, this paper discusses the case study's findings and suggests a technique for creating a sustainable balanced scorecard that takes into account several stages including planification, analysis, design, or the use of computer tools. As a result, the research methodology used to conceptualize and carry out the case study was split into seven stages: defining the objectives and questions of the study; formulating a theoretical model; identifying units of analysis; choosing a case; defining research methods and resources; conducting fieldwork; gathering data; classifying and triangulating information; developing an improved theory, model, or methodology; and confirming the thoroughness and caliber of the investigation. The paper shows a methodology organized in phases and activities that allow a sustainable balanced scorecard to be planned, designed, built, computerized, and controlled to integrate sustainability within the management systems of organizations.

Keywords: Business intelligence, Computer decision support systems, Strategy management, Sustainability, Corporate social responsibility, Sustainable development.

1. Introduction

Research To support both operational and strategic decision-making, business intelligence (BI) combines computer systems, knowledge management, and managerial processes to collect, store, analyze, and visualize data. This provides complex internal and competitive organizational information. (Nuseir, 2021). Through reporting, OLAP analysis, dashboards, or data mining, BI enables non-technical computer users to evaluate and display linked data, producing actionable information (Corrales-Garay et al., 2022).

According to Attar-Khorasani and Chalmeta (2023), there are two viewpoints that need to be considered when implementing BI: the technology view and the management view. The tools, software, and computers used to locate, gather, arrange, and retrieve a greater variety of data from many data sources are the main focus of the technological viewpoint. On the other hand, the managerial view is focused on the coordination and management of the processes to offer timely, actionable, high-value and accurate business insights from data stored in different information sources (inside and outside the company) (Chee et al., 2009).

One type of business intelligence (BI) instrument (Nuseir, 2021; Olszak et al., 2022) that makes it possible to put strategy into practice is the balanced scorecard (BSC) (Kaplan and Norton, 1996). Four viewpoints make up its structure: financial, customer, process, and training. A hierarchical structure is used in the development of the BSC to specify long-term strategic goals and determine the metrics by which each perspective's goals can be measured for success. The BSC's top-down methodology makes sure that all action plans and business processes are in line with achieving the business strategy. This BSC characteristic, along with its comparatively easy handling of organizational intangibles, makes it appropriate for managing the notions of sustainability (Figge et al., 2002).

2. Literature Survey

The literature has a lot to say on the integration of sustainability into management. Re-engineered 4th Generation Management (Hallioui et al., 2022) is a new business management style that focuses on sustainability and customers. It is intended to make businesses more modern in the context of Industry 4.0 (Smiari et al., 2020), the circular economy (Tjahjadi et al., 2023), smart cities, competitiveness, and a wide range of stakeholders (Addazi and Ciccozzi, 2021). A development of the Balanced Scorecard (BSC), the Sustainability Balanced Scorecard (SBSC) integrates sustainability objectives and performance metrics with the four traditional BSC perspectives, as well as sustainability ethical, environmental, social, and governance issues (Mamudu et al., 2023). According to Mio et al. (2021), there are four ways to go about doing this: defining a new perspective; incorporating sustainability concepts into the customer perspective; developing a new BSC that only includes the sustainability dimensions; or integrating sustainability concepts within the four traditional BSC perspectives. According to Schaltegger and Wagner (2006), the SBSC can assist businesses in putting into practice a sustainable strategy by supporting regulatory data needs, encouraging sustainability management and decision-making, and providing information to stakeholders. Nevertheless, despite the SBSC's growing popularity among academics and industry professionals (Hansen and Schaltegger, 2018) and its suitability as a business intelligence tool for integrating sustainability and strategy in firms (Hansen and Schaltegger, 2016), there is a need for research on SBSC frameworks and methodologies to support their development and application (Shreyanshu et al., 2023; Mio et al., 2021).

Particularly pertinent to universities is the paucity of research on SBSC development (Fuchs et al., 2020). According to Filho et al. (2023) and Hurtado et al. (2019), universities are essential to inclusive and sustainable development because they facilitate the transmission of information and creativity through their research projects and courses. Universities understand that sustainability contributes to their reputation, improves staff dedication, morale, and productivity in internal business processes, and is a measure of their overall quality (Saeidi et al., 2015). Globally, universities are adapting their infra-

structure, mission, vision, and teaching methods (Mac-lean et al., 2022; Lee and Lee, 2021) in order to better address the public's growing demand for a sustainable society and to better address social and environmental concerns (Lin et al., 2016). In fact, according to Salvioni et al. (2017), the best institutions in the world are now progressively integrating sustainable practices into their outreach, business processes, courses, and evaluation.

As a result, it's critical to understand the lessons that universities have learned from their adoption of the SBSC in order to promote the integration of sustainability into their daily operations and strategy. This knowledge will encourage university administrators everywhere to embrace sustainability. This paper offers an exploratory research on the lessons learned by three universities that included sustainability inside their strategic formulation and implementation using the SBSC, to assist university managers in the management of sustainability using an SBSC. The findings obtained make it possible to identify key aspects in the process of employing the SBSC as a tool for integrating sustainability in the management of the university. The study seeks to contribute to the recent, scarcely investigated research challenge concerning how organizations address sustainability through performance measurement tools, such as the SBSC (Wu et al., 2021; Yaakub and Mohamed, 2020).

Table 1: Summary of Literature Review

Sr. No.	Author	Title	Proposed	Methodology
1.	Hallioui et al., 2022	Systems-based approach to contemporary business management: An enabler of business sustainability in a context of industry 4.0, circular economy, competitiveness and diverse stakeholders	To propose a Re-engineered 4th Generation Management as a systems-based approach, enabling today's business to be oriented toward customer and sustainability.	Systems-based approach, which is best suited for sustainable businesses in the context of Industry 4.0 digitalization technologies (e.g., Artificial intelligence, Blockchain, Cloud computing, and Big data analytics), Circular Economy, Stakeholders, and Competitiveness.
2.	Tjahjadi et al., 2023	siness strategy, spiritual capital and environmental sustainability performance: mediating role of environmental management process	To investigate the influence of business strategy and spiritual capital on environmental sustainability performance.	This study addresses the issue of previous research gaps. By employing a mediation research framework, this study argues that environmental management process has a mediating role in business strategy–environmental sustainability performance relationships
3.	Mamudu et al., 2023	process mining impacts framework	This study proposes a framework that identifies the key categories	The proposed framework captures PM impacts in four main categories: (a) impact on the

			of Process Mining impacts and their interrelationships.	process, (b) customer impact, (c) financial impact, and (d) impact on innovation and learning. The authors extended this analysis to identify the interrelationships between these categories, which vividly demonstrates how impact on the process mediates the attainment of the other three impact types.
4.	Shreyanshu et al., 2023	cision-making in smart manufacturing: A framework for performance measurement	This study addresses the research gap by defining potential indicators to quantify SMPMs referred to as smart manufacturing performance indicators (SMPIs) identified through literature review methodology.	The conceptual framework provides guidelines to plan and select the preferred focused manufacturing output and the relevant set of SMPIs contributing to the outputs for expediting effective smart manufacturing implementation.
5.	Filho et al., 2023	egrating the Sustainable Development Goals into the strategy of higher education institutions	This paper reports on an international study among a sample of 128 members of higher education institutions (HEIs) located in 28 countries, which aimed at ascertaining the extent to which the SDGs are being integrated into the strategy of HEIs. The focus of this paper is on the means which have been deployed by various universities in order to embed or include the SDGs in their activities.	More specifically, this paper explores 1) the scope of integration, 2) the organisational influences, and 3) strategic influencing factors. The research identified the fact that, whereas many organizations are aware of the need for and the relevance of sustainable development and consider it as part of their institutional settings, the same cannot be said for the SDGs, whose level of emphasis is that many HEIs are comparatively somewhat limited.

3. Methodology

The research method for the conceptualization and execution of the case study is divided into seven phases as shown in fig 1.

Phase 1: Definition of research goals and questions

The goals of this case study were:

a) To test a methodology to integrate sustainability concepts into the management systems of educational institutions using a sustainable BSC;

b) To analyze the findings in order to determine the improvement offered by the methodology;

c) To improve the initial methodology with the aid of the lessons learned and the conclusions drawn from the case study; and

d) To develop practical examples that can be used as reference models in other implementations.

A research question, which will be evaluated while the case study is being carried out, was developed:

RQ1. How can universities incorporate sustainability within their management system, thereby aligning their strategy and action plans with sustainability?

Fig 1: Seven phases for the conceptualization and execution of the case study

Phase 2: Proposed theoretical model

In order to integrate sustainability into the management systems of educational institutions, a sustainable BSC can be planned, created, built, and controlled using the theoretical model, which is a methodology structured in phases, activities, and tasks. While the responsibilities and activities are unique to the creation and execution of an SBSC, the phases are typical of the development of an information system. The proposed theoretical model is as shown in fig 2.

Phase 3: Identification of units of analysis: Case selection

After Walsham (1995) proposed generalizing a theory from an interpretative analysis of case studies, three institutions used the provided theoretical model to use a sustainable BSC to integrate sustainability into their management systems.

The criterion of picking only universities was established in accordance with the purposive sample technique for the identification and selection of cases rich in information with the most efficient use of limited resources (Patton, 2002). The following factors were met by this choice, which led to its selection:

1. Universities declared their willingness in participating in this type of research, as well as their availability, cooperation, and access to the essential data (Palinkas et al., 2015);

2. A standard variable, such as a group of businesses in the same industry, must be present in each instance in the multiple-case study approach (Diop and Liu, 2020). The three case studies in this instance are related to the same industry: education and research;

3. Homogeneous and typical case sampling, such as the one used in this study, offers greater depth in the findings;

4. The proposed theoretical model application to these universities had the potential capacity to generate the necessary enhancement of the basic theory, which is another necessary requirement (Crowe et al., 2011).

5. Because there is a dearth of research on SBSC implementation, the results of the theoretical model application to the three universities can serve as reference models for academics and practitioners interested in enhancing the sustainability of other universities; additionally, the homogeneity of the case studies facilitates the organization of meetings, provides templates for data collection, and streamlines the analysis of the results.

University 1 (UNI 1) is a young Spanish university founded at the beginning of the 1990s. It has around 15,000 students, 1500 teachers and 480 employees. University 2 (UNI 2) is a Spanish university also founded at the beginning of the 1990s, with around 161,231 students, 1500 teachers and 1400 employees. Finally, University 3 (UNI 3) is a South American university founded at the beginning of the 1990s with around 22,000 students, 1300 teachers and 500 employees.

Phase 4: Definition of research methods and resources

Once the three universities were chosen, the fieldwork was organized and started. Mixed work teams, comprising the authors and employees of the collaborating universities, were formed to implement the proposed theoretical model. Department heads and middle managers from the various participating universities were briefed on the project's objective, the stages of the suggested theoretical model, and the sustainability-related issues that needed to be addressed at each stage during seminars and meetings. Following the completion of each step of the process, copies of the reports and documents utilized in the universities, as well as interviews conducted using a combination of templates and questionnaires were used to gather data. After each step was completed, interviews were conducted to address any issues and/or implement any recommended improvements before moving on to the following phase's implementation. At every stage, the interviews had the following goals: to evaluate the results, to get input from the respondents regarding their experiences, to identify issues and mistakes found, and to get suggestions for enhancing the approach. The interview questions were the same for every candidate and were tailored to the unique features of each phase.
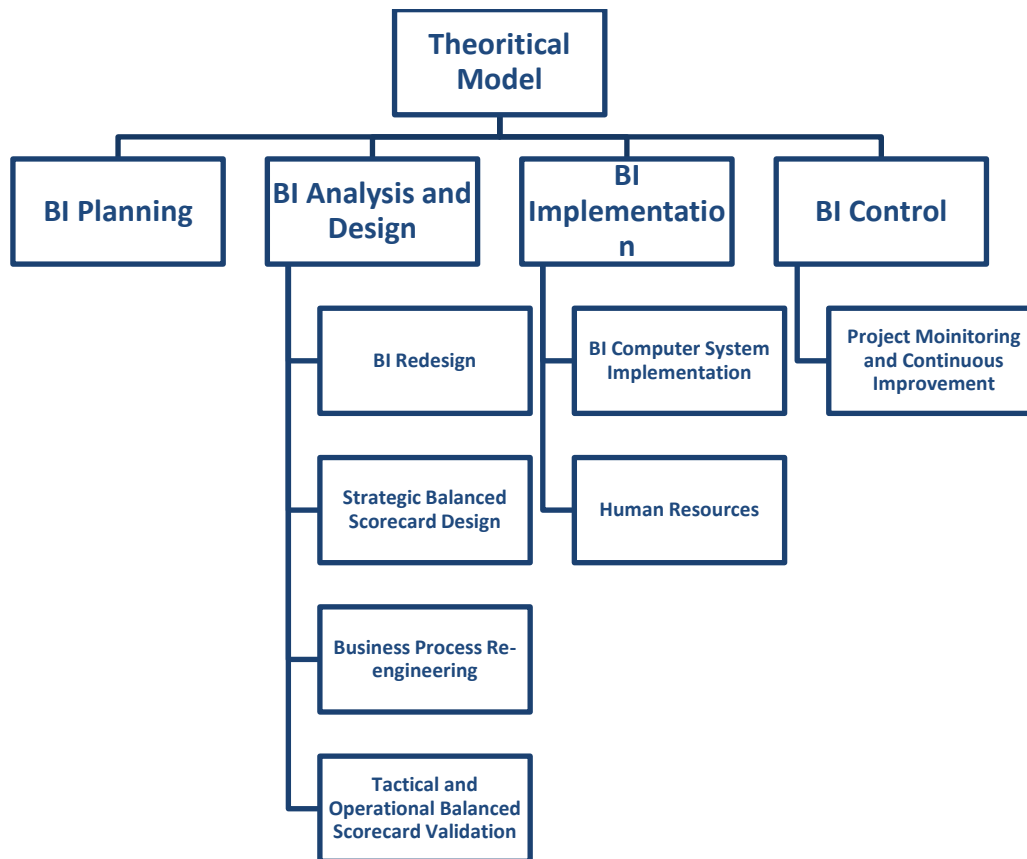
Fig 2: Proposed theoretical model

Phase 5: Fieldwork: Data collection, classification of information and triangulation

The process of collecting data involved compiling the outcomes of implementing the suggested theoretical model at each university. The following stage involved categorizing the various recommendations that each mixed work group made for enhancing the suggested theoretical model in light of their experiences.

According to Yin (1998), in order to guarantee that the research could be theoretically duplicated, a variety of data sources were selected, including primary data from semi-structured interviews and questionnaires and secondary data from university records, information disclosure on the internet, and social media. Because they were deemed to be of lower value, other sources—such as photos and videos—used in qualitative investigations were not included.

Following the principle of triangulation, the criterion adopted in this research was that of incorporating into the initial SBSC methodology any proposal for improvement reviewed and agreed on by the members of the mixed work teams.

Phase 6: Formulation of the enhanced theory, model or methodology

Next, the most important improvements suggested by the three universities are shown, organized according to the activities, together with examples of the application of the methodology.

1. Project planning activity. The first activity consists of project planning and aims to create project teams, determine the scope, carry out a project plan and create a communication plan.

2. Strategic balanced scorecard design activity. Each university has considered different perspectives to classify the indicators:

1.1 UNI 1 establishes four perspectives: knowledge transfer, transparency and accountability, governance, and relations with the environment and society.

1.2 UNI 2 establishes five perspectives: funders, customers and suppliers, internal processes, employees and training, and society and environment.

1.3 UNI 3 defines seven perspectives: financial, customers and suppliers, processes, technology, training and labour relations, social, and environmental. Once the perspectives have been defined, in all three cases the strategic objectives and the indicators for their measurement are identified.

Regarding the definition of indicators, UNI 2 uses a template to detail the characteristics of each indicator, the maximum and minimum acceptable values for the indicator, the frequency of measurement, the degree of importance, as well as the corrective actions in the event that the indicator is out of range.
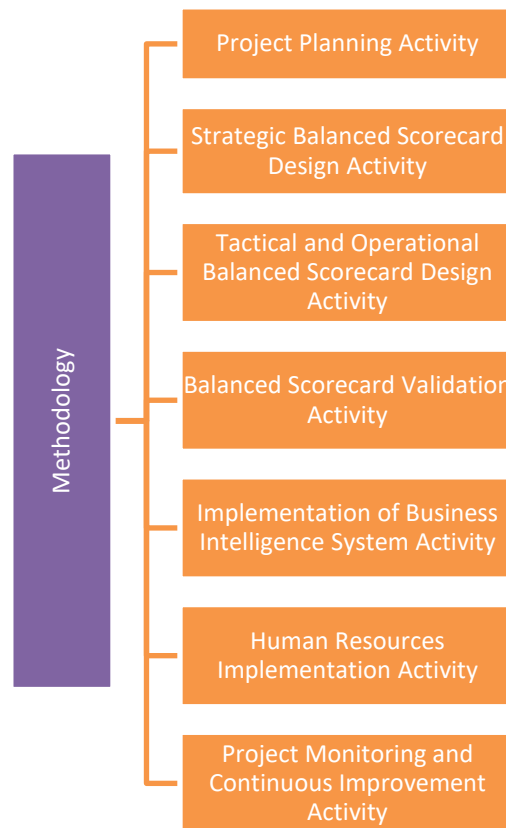
Fig 3: **Formulation of the enhanced theory, model or methodology**

3 Tactical and operational balanced scorecard design activity. The operational level objectives, indicators, and cause-and-effect correlations are defined during this phase. In order to do this, the three universities set tactical and operational goals as well as identify a set of responsibility centers (such as the office of the rector, staff members in administration and services, teaching staff, etc.). There is a hierarchy of objectives because all of these goals are in line with the strategic goals that were previously established. It is clear from all three examples that every department and employee in the university has to understand how critical their work is to accomplishing the institution's strategic goals. As a result, they are able to take part in the tactical and operational level definition of the indicators.

4 Balanced scorecard validation activity. This phase involves validating the cause-effect relationships, goals, and overall system of indicators and making any necessary revisions. To establish the objectives and confirm the correlation between the indicators:

1. The Stakeholders Committee is involved in UNI 1 and data from prior periods are used.
2. In order to validate the indicators and their relationships through a triangulation study, UNI 2 suggests involving stakeholders through dialogue tables.
3. UNI 3 suggests the periodic validation of the BSC and its indicators based on data from prior periods in order to confirm and, if necessary, adjust the cause-and-effect relationship.

5 Implementation of business intelligence system's activity. To make the deployment of SBSCs easier, digital technologies are required (Olawumi and Chan, 2022). They facilitate the automatic gathering, processing, and visualization of data needed to compute the indicators.

1. In each of the three scenarios, the information systems department head must oversee a project that implements the BI computer system.
2. Additionally, the choice is made in all three situations to purchase an already-existing BSC BI software package. In order to choose it, the functional requirements at UNI 2 were previously outlined and categorized into seven categories: technological, administrative, monitoring, alert, decisional, general, and human resources.
3. In all cases, it is necessary to develop the ETL processes (extraction, transformation and loading) to obtain data from the source systems (for example, the ERP of the university) and to load them in a data warehouse.

6 Human resource implementation activities. The significance of human resources (HR) training for effective change management, using the BSC BI software, carrying out and managing the university business project, and gathering data from stakeholders to aid in decision-making is emphasized in each of the three scenarios.

1. There are two established training and communication programs at UNI 1, one for change management and the other for the growth of the SBSC. Because of this, all university departments and staff members are aware of the SBSC implementation and have adjusted their work to meet the new operational, tactical, and strategic goals.
2. UNI 2 emphasizes the necessity of providing training to all pertinent parties.
3. In the case of UNI 3, they implement a communication and change management plan, establish a group of specialists to support university staff in the use of the BSC BI software, promote staff training and introduce a continuous improvement system based on users' suggestions (for example, a suggestions box).

7. Project monitoring and continuous improvement activity.

1. At UNI 1, the creation of a strategy for informing the stakeholders about the project's outcomes marks the start of the monitoring phase. The next step is to form a strategy monitoring committee, whose members will regularly review the indicators, pinpoint risks, and create action plans for improvements.

2. In UNI 2, there is an individual responsible for overseeing the SBSC at each of the various affiliated centers, including faculties and schools. They are in charge of examining the indicators' results, determining any deviations, and, when necessary, offering suggestions for improvement. On the university website, the results will be accessible to the public. Action plans will be developed with input for improvement from a variety of internal and external stakeholders.

3. In UNI 3, different monitoring periods are defined at the strategic and operational levels. In the first case, the indicators will be evaluated every six months and in the second case, monthly. The strategic objectives and the indicators to measure them will be valid for a maximum of 4 years, coinciding with the strategic plans of the university. After this period, their validity will be reviewed. In the case of the operational objectives and the indicators to measure them, a validity period of one year is established. After this period, its continuity will be reviewed.

Phase 7: Verification of the rigour and quality of the study

Finally, the results were assessed using Yin's (1998) model to determine their validity and degree of confidence. Construct validity, internal validity, external validity, and reliability tests are the four tests that this model suggests using to guarantee the consistency and dependability of research based on case studies. Consequently, each of the four tests was examined in accordance with Yin's (1998) recommendations to guarantee the validity of the findings. Construct validity has been demonstrated by the fact that data was collected from a variety of sources and that the final approach was chosen with consensus from the members of several teams. Triangulation was used to analyze the data gathered from semi-structured interviews, direct observations, and documentation review, proving internal validity. The approach has been shown to have external validity in multiple cases. This has demonstrated its theoretical replication, which is a crucial component in the establishment of external validity. Finally, the careful adherence to the Walsham (1995) approach for data gathering has demonstrated reliability. As a result, the study's findings can be obtained again. Therefore, it is possible to verify the study's validity and caliber.

4. Conclusion

Using a sustainable BSC, the authors of this research have presented a methodology that enables university managers to include the three sustainability elements into their daily management of the university. The suggested methodology outlines all of the stages, tasks, and activities of the entire university SBSC project life cycle. It incorporates improving the university's sustainability strategy, meeting the needs and requirements of stakeholders while also enticing and involving them in the formulation of the university's goals and action plans, re-engineering the business procedures of the institution, developing a computer system for the computation and visualization of indicators, and providing training for human resources. Additionally, the approach and examples of its application to the three case studies might be useful for practitioners, such as sustainability managers, computer engineers, and university management, who can use them as a reference for developing SBSCs at other universities. Lastly, it is important to steer future research away from the primary paper constraint, which is the requirement to demonstrate the findings' generalizability. More examples in both comparable and dissimilar contexts would help to further illuminate the cross-sectional applicability of the suggested methodology. It makes no claims about statistical generalization—only analytical

generalization. However, a quantitative examination of the financial effects of implementing a sustainable BSC might be undertaken.

References

1. Addazi, L. and Ciccozzi, F. (2021), "Blended graphical and textual modelling for UML profiles: a proofof- concept implementation and experiment", Journal of Systems and Software, Vol. 175, 110912, doi: 10.1016/j.jss.2021.11091.

2. Al-Bahi, A.M., Abd-Elwahed, M.S. and Soliman, A.Y. (2021), "Implementation of sustainability indicators in engineering education using a combined balanced scorecard and quality function deployment approaches", Sustainability, Vol. 13 No. 13, p. 7083, doi: 10.3390/su13137083.

3. Al-Okaily, A., Teoh, A.P. and Al-Okaily, M. (2023), "Evaluation of data analytics-oriented business intelligence technology effectiveness: an enterprise-level analysis", Business Process Management Journal, Vol. 29 No. 3, pp. 777-800, doi: 10.1108/BPMJ-10-2022-0546.

4. Attar-Khorasani, S. and Chalmeta, R. (2023), "Internet of things data visualization for business intelligence. Big data", Ahead of print, doi: 10.1089/big.2021.0200.

5. Baumgartner, R.J. (2014), "Managing corporate sustainability and CSR: a conceptual framework combining values, strategies and instruments contributing to sustainable development", Corporate Social Responsibility and Environmental Management, Vol. 21 No. 5, pp. 258-271, doi: 10.1002/csr.1336.

6. Chee, T., Chan, L.K., Chuah, M.H., Tan, C.S., Wong, S.F. and Yeoh, W. (2009), "Business intelligence systems: state-of-the-art review and contemporary applications", Symposium on progress in information & communication technology, Vol. 2 No. 4, pp. 16-30.

7. Corrales-Garay, D., Ortiz-de-Urbina-Criado, M. and Mora-Valent_ın, E.-M. (2022), "Understanding open data business models from innovation and knowledge management perspectives", Business Process Management Journal, Vol. 28 No. 2, pp. 532-554, doi: 10.1108/BPMJ-06-2021-0373.

8. Crowe, S., Cresswell, K., Robertson, A., Huby, G., Avery, A. and Sheikh, A. (2011), "The case study approach", BMC Medical Research Methodology, Vol. 11, p. 100, doi: 10.1186/1471-2288-11-100.

9. Diop, K.A.S. and Liu, E. (2020), "Categorization of case in case study research method: new approach", Knowledge and Performance Management, Vol. 4 No. 1, pp. 1-14, doi: 10.21511/kpm.04(1). 2020.01.

10. Figge, F., Hahn, T., Schaltegger, S. and Wagner, M. (2002), "The sustainability balanced scorecard - linking sustainability management to business strategy", Business Strategy and the Environment, Vol. 11 No. 5, pp. 269-284, doi: 10.1002/bse.339.

11. Filho, W.L., Simaens, A., Paço, A., Hernandez-Diaz, P.M., Vasconcelos, C.R.P., Fritzen, B. and Mac-Lean, C. (2023), "Integrating the Sustainable Development Goals into the strategy of higher education institutions", International Journal of Sustainable Development and World Ecology, Vol. 30 No. 5, pp. 564-575, doi: 10.1080/13504509.2023.2167884.

12. Fuchs, P., Raulino, C., Conceiç~ao, D., Neiva, S., Amorim, W.S.d., Soares, T.C., Andrade de Lima, M., Montenegro De Lima, C.R., Soares, J.C. and Andrade Guerra, J.B.S.O.d.A. (2020), "Promoting sustainable development in higher education institutions: the use of the balanced scorecard as a strategic management system in support of green marketing", International Journal of Sustainability in Higher Education, Vol. 21 No. 7, pp. 1477-1505, doi: 10.1108/IJSHE-02-2020-0079.

13. Gond, J.P., Grubnic, S., Herzig, C. and Moon, J. (2012), "Configuring management control system: theorizing the integration of strategy and sustainability", Management Accounting Research, Vol. 23 No. 3, pp. 205-223.

14. Guerra, JBSOD., Garcia, J., Lima, M.D., Barbosa, S.B., Heerdt, M.L. and Berchin, II. (2018), "A proposal of a Balanced Scorecard for an environmental education program at universities", Journal of Cleaner Production, Vol. 172, pp. Page1674-1690.

15. Hallioui, A., Herrou, B., Santos, R.S., Katina, P.F. and Egbue, O. (2022), "Systems-based approach to contemporary business management: an enabler of business sustainability in a context of industry 4.0, circular economy, competitiveness and diverse stakeholders", Journal of Cleaner Production, Vol. 373, doi: 10.1016/j.jclepro.2022.133819.

16. Hansen, E.G. and Schaltegger, S. (2016), "The sustainability balanced scorecard: a systematic review of architectures", Journal of Business Ethics, Vol. 133 No. 2, pp. 193-221, doi: 10.1007/s10551-014- 2340-3.

17. Hansen, E.G. and Schaltegger, S. (2018), "Sustainability balanced scorecards and their architectures: irrelevant or misunderstood?", Journal of Business Ethics, Vol. 150, pp. 937-952, doi: 10.1007/s10551-017-3531-5.

18. Hubbard, G. (2009), "Measuring organizational performance: beyond the triple bottom line", Bus. Strategy Environ., Vol. 19, pp. 177-191.

19. Hurtado, D.G., Perez, R.N. and Devece, C. (2019), "Contribution from the balanced scorecard implemented at the university of ciego de Avila to the sustainable development of the territory", EDULEARN19: 11TH International Conference on Education And New Learning Technologies, pp. 6363-6368.

20. Jancic, Z. (1999), Celostni Marketing, 2nd ed., FDV, Ljubljana.

21. Kaplan, R.S. and Norton, D.P. (1996), "Linking the balanced scorecard to strategy", California Management Review, Vol. 39 No. 1, pp. 53-79, doi: 10.2307/41165876.

22. K€uç€ukbay, F. and S€ur€uc€u, E. (2019), "Corporate sustainability performance measurement based on a new multicriteria sorting method", Corporate Social Responsibility and Environmental Management, Vol. 26 No. 3, pp. 664-680, doi: 10.1002/csr.1711.

23. Leal Filho, W., Pallant, E., Enete, A., Richter, B. and Brandli, L.L. (2018), "Planning and implementing sustainability in higher education institutions: an overview of the difficulties and potentials", The International Journal of Sustainable Development and World Ecology, Vol. 25 No. 8, pp. 1-9, doi: 10.1080/13504509.2018.1461707.

24. Lee, S. and Lee, S. (2021), "Can universities be a platform for climate mitigation? Exploring the impacts of carbon pricing in the university setting", International Journal of Sustainable Development and World Ecology, Vol. 28 No. 8, pp. 759-770, doi: 10.1080/13504509.2021.1902877.

25. Lin, M.H., Hu, J.Y., Tseng, M.L., Chiu, A.S.F. and Lin, C.Y. (2016), "Sustainable development in technological and vocational higher education: balanced scorecard measures with uncertainty", Journal of Cleaner Production, Vol. 120 No. 1, pp. 1-12.

26. Mac-lean, C., N_u~nez-C_ardenas, P., Rodr_ıguez, B.X. and Aldea, C. (2022), "Green buildings in Chilean public higher education: a trend or a must-have in university strategic guidelines?", International Journal of Sustainable Development and World Ecology, Vol. 29 No. 8, pp. 756-770, doi: 10.1080/13504509.2022.2095452.

27. Mamudu, A., Bandara, W., Leemans, S.J.J. and Wynn, M.T. (2023), "A process mining impacts framework", Business Process Management Journal, Vol. ahead-of-print No. ahead-of-print, doi: 10.1108/BPMJ-09-2022-0453.

28. Mio, Ch., Costantini, A. and Panfilo, S. (2021), "Performance measurement tools for sustainable business: a systematic literature review on the sustainability balanced scorecard use", Corporate Social Responsibility and Environmental Management, Vol. 29 No. 2, pp. 367-384, doi: 10.1002/csr.2206.

29. Mohd, A., Hairuddin and Ayodele, L.A. (2018), "Balanced scorecard for future sustainability of Malaysian higher education institutions", The European Proceedings of Social & Behavioural Sciences, pp. 1-13, ISSN 2357-1330.

30. Nejati, M. and Nejati, M. (2013), "Assessment of sustainable university factors from the perspective of university student", Journal of Cleaner Production, Vol. 48, pp. 101-107.

31. Nuseir, M.T. (2021), "Designing business intelligence (BI) for production, distribution and customer services: a case study of a UAE-based organization", Business Process Management Journal, Vol. 27 No. 4, pp. 1275-1295, doi: 10.1108/BPMJ-06-2020-0266.

32. Olawumi, T.O. and Chan, D.W. (2022), "Cloud-based sustainability assessment (CSA) system for automating the sustainability decision-making process of built assets", Expert Systems with Applications, Vol. 188, 116020.

33. Olszak, C.M., Zurada, J. and Cetindamar, D. (2022), "Business intelligence and big data for innovative and sustainable development of organizations", Information Systems Management, Vol. 39 No. 1, p. 2, doi: 10.1080/10580530.2022.2011124.

34. Patton, M.Q. (2002), Qualitative Research and Evaluation Methods, 3rd Sage Publications, Thousand Oaks, CA.

35. Palinkas, L.A., Horwitz, S.M., Green, C.A., Wisdom, J.P., Duan, N. and Hoagwood, K. (2015), "Purposeful sampling for qualitative data collection and analysis in mixed method implementation research", Administration and Policy in Mental Health and Mental Health Services Research, Vol. 42, pp. 533-544, doi: 10.1007/s10488-013-0528-y.

36. Porter, M.E. (1985), Competitive Advantage. Creating and Sustaining Superior Performance, Free Press, New York, p. 557.

37. Saeidi, S.P., Sofian, S., Saeidi, P., Saeidi, S.P. and Saaeidi, S.A. (2015), "How does corporate social responsibility contribute to firm financial performance? The mediating role of competitive advantage, reputation, and customer satisfaction", Journal of Business Research, Vol. 68 No. 2, pp. 341-350, doi: 10.1016/j.jbusres.2014.06.024.

38. Salvioni, D.M., Franzoni, S. and Cassano, R. (2017), "Sustainability in the higher education system : an opportunity to improve quality and image", Sustainability, Vol. 9 No. 2017.

39. Schaltegger, S. and Wagner, M. (2006), "Integrative management of sustainability performance, measurement and reporting", International Journal of Accounting, Auditing and Performance Evaluation, Vol. 3 No. 1, pp. 1-19, doi: 10.1504/IJAAPE.2006.010098.

40. Shreyanshu, P., Kanchan, J. and Milind, A. (2023), "Decision-making in smart manufacturing: a framework for performance measurement", International Journal of Computer Integrated Manufacturing, Vol. 36 No. 2, pp. 190-218, doi: 10.1080/0951192X.2022.2048420.

41. Smiari, P., Bibi, S. and Feitosa, D. (2020), "Examining the reuse potentials of IoT application frameworks", Journal of Systems and Software, Vol. 169, 110706, doi: 10.1016/j.jss.2020.110706.

42. Tjahjadi, B., Soewarno, N., Karima, T.E. and Sutarsa, A.A.P. (2023), "Business strategy, spiritual capital and environmental sustainability performance: mediating role of environmental management process", Business Process Management Journal, Vol. 29 No. 1, pp. 77-99, doi: 10.1108/BPMJ-11-2021-0718.

43. Walsham, G. (1995), "Interpretive case studies in IS research: nature and method", European Journal of Information Systems, Vol. 4, pp. 74-81, doi: 10.1057/ejis.1995.9.

44. Wu, Y., Farrukh, M., Raza, A., Meng, F. and Alam, I. (2021), "Framing the evolution of the corporate social responsibility and environmental management journal", Corporate Social Responsibility and Environmental Management, Vol. 28 No. 4, pp. 1397-1411, doi: 10.1002/csr.2127.

45. Yaakub, M.H. and Mohamed, Z.A. (2020), "Measuring the performance of private higher education institutions in Malaysia", Journal of Applied Research in Higher Education, Vol. 12 No. 3, pp. 425-444.

46. Yin, R.K. (1994), Case Study Research – Design and Methods, Applied Social Research Methods, 5, 2nd ed., Sage, Newbury Park, CA.

47. Yin, R.K. (1998), "The abridged version of case study research: design and method", in Bickman, L. and Rog, D.J. (Eds), Handbook of Applied Social