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Using the analytic hierarchical process to investigate the impact of training on KPIs in an SME: A case study in the printing industry

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Abstract:

This paper proposes an AHP and BSC based approach for evaluating the impact of training investments on KPIs in a manufacturing SME in Chile. The analytic hierarchy is structured in three steps: initial analysis (economic factors), organisational analysis (observation) and the impact of training investment on the economic factors in the initial analysis, in terms of the key performance indicators in each step. The aim of this study is to serve as a first stage in the development of an integrated approach linking key performance indicators (KPIs) to training plans, in order to obtain a working process that can be used to determine the weighted impact of training on KPIs, with a view to calculating the return on training investment in a future second stage of research. This paper integrates a theoretical approach with analytic hierarchical process (AHP) methodology. This new approach has been called hierarchical participatory action analysis (APAJ) and is carried out in five steps. APAJ was found to be a more realistic tool for assessing the cost-effectiveness of training in an organisation. A case study focusing on an SME operating within the printing sector is provided to demonstrate the practical application of the proposed methodology.

Keywords:

analytical kierarchical process, key performance indicators, small and medium-sized enterprises, skills, training, return on investment

1. Introduction

The business world is constantly changing, requiring organisations to create new production processes, products and services at a rapid pace to improve quality and customer service (Rial,

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2016). In order for a company to maintain its competitiveness and success, each decision must be properly evaluated and selected to increase its competitive advantage (Galleguillos et al., 2017).

The balanced scorecard (BSC) is a tool that can be used to improve competitiveness, but it has some shortcomings in terms of implementation on a quantitative basis (Mardani et al., 2015; Quezada et al., 2014). This has led to the integration of methodologies such as the analytic hierarchical process (AHP), which prioritises and weights the perspectives and indicators of the BSC (Álvarez et al., 2017). Many studies focus on financial and customer indicators while neglecting the training perspective. Others show that strengthening the training perspective could help to build trust among investors and stakeholders and improve future performance (Massingham et al., 2018).

Today's companies are increasingly investing in the training of their employees because of the positive economic impact it can have on their success (Tonhäuser & Seeber, 2014). On-the-job training is strengthened by the creation of models and proposals that link the education-employment binomial. The competence-based approach to training involves a reformulation of the concept, linking it to the demands of economic and social development and the needs of each company. This implies important pedagogical changes and innovations in the definition and organisation of learning processes and their subsequent assessment (Clares et al., 2019).

Urbancová et al., 2021, point out that to evaluate the organisational-level benefits of implemented training and development programs, they must align with the organisation's needs. Management should identify areas where monitoring effectiveness is essential. Effectiveness needs observation in all training activities without exceptions. The simplest method is to assess financial costs, but it's also possible to consider the nature of the training activity or the time invested. Additionally, it's crucial for the organisation's management to appropriately determine the variables by which training benefits will be evaluated. These variables should be monitored even before the actual training implementation. All involved parties should be familiar with the objectives and methodology of evaluating training effectiveness, emphasizing that the effectiveness of evaluation is inseparable from the identification of training needs and planning

Obtaining feedback on the effectiveness of training not only helps managers and decision makers to identify areas for improvement, but also provides employees with the knowledge they need to progress and develop their careers (Karim et al., 2019). Ultimately, having a competent and flexible workforce is a must for any competitive business. Training activities

lead to financial benefits such as revenue, cost reduction, savings and profitability. Therefore, measuring the return on investment (ROI) in training is essential for business continuity and success (Salimian, 2021).

There is great interest in measuring the ROI in training using different methodologies and/or tools to improve companies' competitiveness. For example, a method has been defined and tested to empirically measure ROI in architectural firms (Lechhab et al., 2022).

The literature has not yet identified a satisfactory method for evaluating the economic impact of training investment. To fill this gap, the present study aims to serve as a first stage in the creation and application of an integrated approach linking organisational factors (KPIs) to training plans. The ultimate aim is to develop a working process for determining the impact of training on KPIs (first stage) and, as a continuation of this study (second stage), a standardised procedure for calculating the return on training investment. In light of the above, our main research focus is on establishing an approach that incorporates a decision model of key performance indicators (including the impact of training) and prioritises these indicators by taking into account all relationships.

This research aims to answer the main question: How can we develop an approach that integrates a decision model? This model should incorporate key performance indicators (KPIs) that capture the impact of training and prioritize them, taking into account all the interrelationships between them.

The rest of the paper is structured as follows: Section 2 presents the literature review that was used as a starting point for this research. Section 3 describes the methodology of the study. Section 4 illustrates a case study using the proposed approach and analyses the results. Finally, Section 5 outlines some conclusions and future lines of research.

2. Literature preview

Work-based training approaches have been consolidated over the last decade, generating new models and proposals to improve the effectiveness and profitability of in-company training. Castillo and Villalpando (2019) support the competency-based training approach by proposing a reformulation of the concept of training, linking it to the demands of economic and social development and, more specifically, to the needs of the productive world. This implies important pedagogical changes and innovations in company training, especially with regard to the assessment of learning and the definition and organisation of learning processes.

Soft skills are becoming as important as hard skills in the context of job performance and employee competence building. These skills are necessary not only to secure a job, but also to grow within a company and reach one's maximum potential to contribute to its strategic goals (Elmoutanna & Motii, 2022). According to Matia (2016), the competency-based model of vocational education and training (VET) has the following features: it addresses professional qualification processes; it defines learning processes from a global, flexible and dynamic perspective; it promotes the use of innovative, active and problem-solving methodologies; it manages the mobilisation of cognitive, motor, affective and psychosocial resources to find solutions to different challenges; and it facilitates responsibility, cooperation, initiative, creativity and autonomy in the learning process.

There are also other models, such as Kilpatrick's project-based model (Domènech-Casal, 2019), developed by Van der Klink et al. (2007), which focuses on collaborative learning methods that encourage peer learning, project-based learning and a sense of belonging and cohesion in the group. Building on the above models, newer models have also been developed. These include problem-based learning (PBL), which is designed to develop competencies through involvement in projects, while also encouraging self-learning and collaborative learning. PBL does not aim to have people memorise concepts or solve problems individually, but rather to develop competencies that allow for individual knowledge development with the common goal of solving a problem as a team (Tan, 2021).

Another model is work-based learning (WBL), a variant of the PBL methodology, which aims to integrate knowledge with the real needs of each professional sector. WBL is used in continuous in-company training, is based on practice (experience) and learning by doing, and works with a competence development plan for each employee's career. WBL provides a tailor-made training programme that meets the training needs of the company and the individual ambitions of its employees. The aim of WBL is to ensure that the knowledge acquired in different training contexts is applied jointly by several people in order to solve problems as a team (Murtazin et al., 2020; Perusso & Wagenaar, 2022).

Methodologies also exist in the area of workplace learning analysis (WLA). WLA provides structured and holistic assessments to communicate learning outcomes to managers in a summarised and simplified way. This conceptual approach has led to the development of a framework for measuring the impact of workplace learning interventions and has demonstrated the positive impact of social learning in organisations (Kopp & Kinkel, 2020).

In this context, Van Rooij and Merkebu's (2015) study used multiple measures, including win rate, to provide managers with greater insight into how investment in learning contributes to overall organisational performance. It should be noted, however, that the decision makers who participated in this study did not provide information on the relative weight given to each measure.

Within the diverse landscape of training methodologies, each approach possesses unique strengths and weaknesses that warrant careful consideration to ensure optimal effectiveness and tailoring to specific training needs. Kilpatrick's PBL shines in its ability to ignite learner engagement through active participation in projects. By tackling real-world challenges, students cultivate strong motivation, curiosity, and collaboration skills. However, challenges arise concerning resource intensiveness, requiring significant planning and expertise to design engaging projects (Evensen et al., 2000). Additionally, assessing individual contributions within collaborative projects can be challenging, and the open-ended nature might not suit all learning styles (Pereira Pessoa, 2023).

Traditional PBL excels in nurturing problem-solving abilities. Learners actively research and apply knowledge to tackle fictitious scenarios, promoting self-directed learning and critical thinking. In medical education, PBL scenarios simulating complex patient diagnoses hone students' research skills and teamwork in presenting treatment options (Barrows & Tamblyn, 1980). Nonetheless, its suitability for diverse subjects and learning objectives remains uncertain (Savery, 2006). Moreover, the time-consuming nature of problem analysis and research demands strong facilitation skills from instructors to ensure productive team collaboration (Dolmans et al., 2005).

WBL stands out for its emphasis on practical skill application in real-world workplaces. Internships like IT network maintenance projects provide invaluable experiential learning and career readiness. Studies highlight its positive impact on graduate employability and skill development (Abelha et al., 2020). However, access to high-quality WBL opportunities can be unequal, and ensuring qualified mentors and structured learning experiences within diverse organizational settings presents challenges (Bahl & Dietzen, 2019). Furthermore, potential safety concerns require careful planning and oversight, particularly in high-risk environments.

Each model possesses distinct strengths and weaknesses. Kilpatrick's PBL fosters

engagement and authentic learning, traditional PBL cultivates problem-solving and self-directedness, while WBL prioritizes practical application and career readiness. Recognizing these nuances allows for informed selection and adaptation of these models to suit diverse learning needs and contexts. In today's rapidly evolving work environment, combining elements from different training models holds immense potential to create a robust training approach that enhances engagement, develops critical skills, and prepares individuals for success in the real world.

The literature offers several training evaluation models, but the most common methods follow Kirkpatrick's evaluation methodology, which has specific evaluation levels for short and long training programmes: reaction, learning, behaviour and outcomes (Fregonese et al., 2018; Grohmann & Kauffeld, 2013). Phillips and Phillips' (2016) method has five levels of evaluation and focuses on the returns associated with investment in training, expressed as a percentage or proportion. There are many ways to isolate the impact of training, including performance monitoring (Brahmana et al., 2018), surveys (Asadullah et al., 2015; Chochard & Davoine, 2011; Kucherov & Manokhina, 2017; Fregonese et al., 2018; Grohmann & Kauffeld, 2013), management estimates and information reported directly by programme participants (Subramanian et al., 2012).

Curado and Bernardino's (2018) study, based on the Kirkpatrick and Phillips models, used fuzzy set qualitative comparative analysis (fsQCA) to provide a deeper analysis of the factors associated with higher or lower ROI. The study highlights the importance of organising training programmes in small groups. However, its results cannot be generalised due to the use of national data. Another limitation is the lack of some training-related data, such as the gender of programme trainers, the predominant gender of trainees for each programme, and the evaluation scores of trainees and trainers.

In a pioneering move within the insurance field, a recent study introduced a framework that integrates Balanced Scorecard (BSC) models with the best-worst method (BWM) to assess performance across two distinct time periods. The amalgamated BSC-BWM model serves as a valuable tool for managers and decision-makers, enabling them to discern and interpret the competitive strengths of a company. In summary, this model considers both past and future parameters with two different time periods. This allows for a better analysis and study of the organisation's operational business management data. This, in turn, facilitates swift and effective decision-making processes. It's important to note that while this integrated

model is currently tailored for a specific business category, there is ample potential for its application across various industries (Dwivedi et al., 2021).

Salimian (2021) used the general Phillips model and the AHP approach to calculate the ROI of two training modules on electrical protection and uninterruptible power supply (UPS) in a gas company. Although the results are reasonable, they are specific to these two training modules. In addition, they do not evaluate the relationship between multiple KPIs, such as financial, customer, internal process and training KPIs, at a general level.

Several studies in the literature have developed models to measure the effectiveness of training in companies (Grohmann & Kauffeld, 2013; Phillips & Phillips, 2016; Fregonese et al., 2018). However, no model or approach has been found that both uses AHP decision making tools and also integrates an organisation's KPIs and evaluates the impact of training investment on them. Our aim is to propose an approach for measuring the impact of training investment indicators in conjunction with the AHP methodology, in order to reduce the qualitative factor in the evaluation of training.

3. Methodology

This paper is based on the integration of a theoretical approach for evaluating the impact of training on KPIs with the AHP methodology. This new approach has been named hierarchical participatory action analysis (APAJ) and is carried out in the five steps described below.

Step 1. Creation of an integrated approach to training profitability: this approach was defined and developed by an in-company training expert with the aim of reliably measuring the profitability of training investments and improving efficiency. To this end, observations were first carried out in six companies where the expert works as a consultant. Key questions were then identified in relation to what was observed (initial analysis and organisational analysis), followed by the relevant actions. A literature review was subsequently conducted to corroborate the selected KPIs.

The proposed KPIs offer a wide range of measures covering both financial and non-financial aspects of in-company training. These KPIs play a key role in justifying investment in training. The collection of data combines internal sources with insights from staff surveys

and questionnaires. This integrated approach ensured that our data collection captures both quantitative metrics and qualitative insights essential for our new methodology.

Training costs (KPI-1 and KPI-2): These indicators enable the calculation of both direct and indirect costs associated with training programmes. An accurate assessment of these costs provides a complete picture of training-related expenditure and is essential for calculating ROI (Devarakonda, 2019).

Competencies (KPI-3): Competency levels should be measured before and after the training intervention to assess the impact of development programmes on employee skills and knowledge. This KPI makes it possible to assess whether employees acquire the necessary competencies to achieve the company's objectives (Gómez, 2022).

The economic variables (KPI-4 to KPI-8) quantify the financial impact of training. Productivity, turnover, efficiency, quality and lead time can increase as a result of training. These KPIs provide concrete data on how training contributes to financial results (Aragón-Sánchez et al., 2003).

Organisational factors (KPI-9 and KPI-10) are taken into account to measure the work climate and competitiveness. García et al., (2012) conducted a study on the impact of training on company culture and competitive position. A favourable work climate can lead to higher employee retention and better performance, while improved competitiveness can generate strategic advantages.

Social factors (KPI-11 to KPI-13): These KPIs assess the impact of training on the social dynamics of the organisation. Internal promotion, attrition and absenteeism are indicators of how training affects internal mobility and talent retention. Continuous training can be used as a tool to motivate employees (Rial, 2016).

Training factors (KPI-14 to KPI-16): These indicators evaluate the effectiveness of training programmes in terms of learning transfer, thus assessing the new level of competence as well as the development of transferable skills, such as the previously mentioned soft skills (Sreehari, 2021).

This analysis provided the final approach to be used in the study. Information on the proposed KPIs (analysed in the first three steps) is collected and combined with the AHP methodology

to determine the impact of training on them. These KPIs are shown in Figure 1.

Step 2. Establishment of hierarchical relationships: the expert team established the hierarchy and relative importance of each step (criteria) in relation to each KPI (alternatives). The Super Decisions software was used to extract the weights of the established hierarchy and to perform the subsequent analysis of the AHP methodology.

Step 3. A comparison matrix (j) was created using a pairwise comparison index (j_{ij}). Each decision maker was asked to express the relative importance of two decision items at the same level (e.g. two criteria) using a nine-point scale. The pairwise comparison scores were compiled and the pairwise comparison matrices were constructed for each decision maker. The pairwise comparison was performed using the Saaty (1980) scale of relative importance scores, which ranges from 1 to 9, where 1 indicates equal importance of the two items and 9 indicates high importance of one item (matrix row component) compared to the other item (matrix column component) (Meade & Sarkis, 1999). For n number of comparison items, the comparison matrix is defined in Eq 1:

$$\boldsymbol{j} = \begin{bmatrix} j_{11} & j_{12} & \cdots & j_{1n} \\ j_{21} & \ddots & \boxdot & j_{2n} \\ \vdots & \boxdot & \ddots & \vdots \\ j_{n1} & j_{n2} & \cdots & j_{nn} \end{bmatrix} \quad (1)$$

For diagonal entries, i.e. $i=j$, $j_{ij}=1$, the upper right triangular comparison elements j_{ij} must be defined by the decision maker, while the lower left triangular entries are obtained by taking reciprocals, i.e. $j_{ji}=1/j_{ij}$.

Step 4. The consistency of the pairwise comparisons of Eq 1 had to be checked as it depends on people's preferences (Zahedi, 1986). The consistency index (CI) is estimated with the eigenvalue λ and the eigenvector W by solving the formulation defined in Eq 2.

$$(j - \lambda I) * W = 0 \quad (2)$$

The maximum eigenvalue is therefore given by $\lambda_{max}=\max(\lambda)$ (Saaty, 1980). The CI indicates whether a decision maker provides consistent values, where n is the dimension of the comparison matrix. The CI is defined in Eq 3.

$$IC = (\lambda_{max} - n)/(n - 1) \quad (3)$$

where n is the number of elements to be compared in the matrix. The final inconsistency is obtained using the consistency ratio (CR) defined in Eq 4.

$$CR = (IC/RI) * 100 \quad (4)$$

Where RI is the random index obtained by averaging the CI of a randomly generated reciprocal matrix (Saaty, 1980). The maximum accepted value of CR is 10% (Saaty, 1980). If the consistency test is not passed, the decision maker must revise the original scores in the pairwise comparison matrix. This would mean consulting the experts again.

Step 5. Calculate the weights: the result of the priority vectors was determined using Eq 5:

$$j * W = \lambda_{max} * W \quad (5)$$

Where,

j is the pairwise comparison matrix;

W is the vector of priorities; and

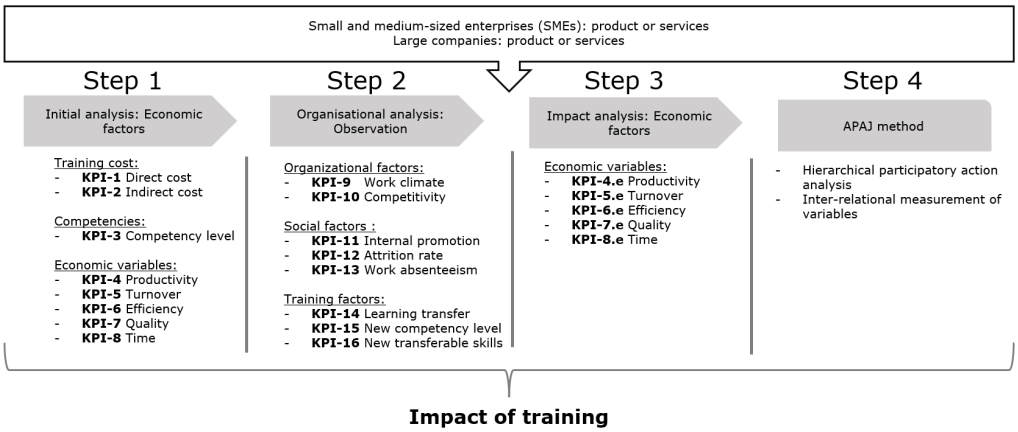
λ_{max} is the maximum eigenvalue of the matrix A.

4. Results

The case study is a Chilean printing SME with a market segment of small businesses in the city of Rancagua, Chile. An analysis of Porter's 5 Forces showed that the sector is highly competitive. Because of this, the company is always looking to increase its competitiveness by training its workers, with a focus on measuring the return on investment of this training. To illustrate this, the APAJ approach is described below, step by step.

Step 1: In this case, the owners of the SME met with the expert trainer who created the approach to review and define the KPIs to be measured in the company. Figure 1 shows the steps of the process and the KPIs included in each one.

Figure 1. Steps of the APAJ approach



Source: Author's own elaboration

Step 2: The hierarchical structure was constructed with decision elements (e.g. criteria and detailed criteria). The KPI levels and names are shown in Table 1. Figure 2 then presents the actual hierarchy.

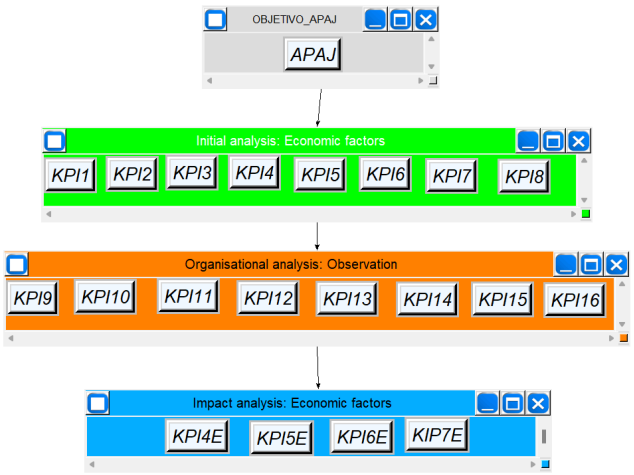
Table 1. KPI levels and names

Training cost:	**Organisational factors:**	**Economic variables:**
KPI-1 Direct cost	KPI-9 Work climate	KPI-4.e Productivity
KPI-2 Indirect cost	KPI-10 Competitivity	KPI-5.e Turnover
		KPI-6.e Efficiency
Competencies:	**Social factors:**	KPI-7.e Quality
KPI-3 Competency level	KPI-11 Internal promotion	KPI-8.e Time
	KPI-12 Attrition rate	
	KPI-13 Work absenteeism	
Economic variables:	**Training factors:**	
KPI-4 Productivity	KPI-14 Learning transfer	
KPI-5 Turnover	KPI-15 New competency level	
KPI-6 Efficiency	KPI-16 New transferable skills	

KPI-7 Quality
KPI-8 Time

Source: Author's own elaboration

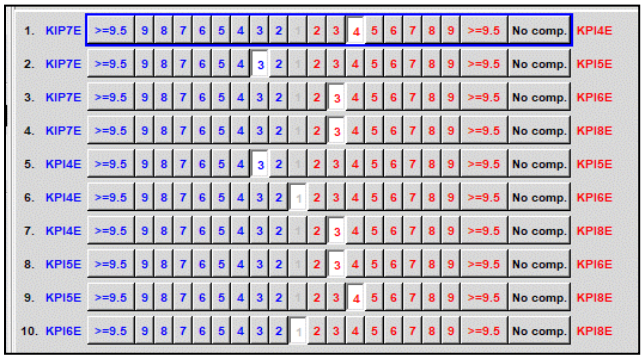
Figure 2. Hierarchical levels of the case study using the APAJ approach



Source: Author's own elaboration

Step 3: The pairwise comparison matrix was then developed. For the case study, each KPI was compared for each hierarchical level. The group of experts that defined the weight of each KPI in relation to the others was composed of owners, shareholders of the SME, the expert/creator of the approach and company employees such as its accountant. As mentioned above, the relative weights were determined using a scale of 1 to 9, where 1 indicates equal importance of the two elements (KPIs) and 9 indicates greater importance of one of the two elements (KPIs). As an example of all the comparisons, Figure 3 shows the pairwise comparison of the KPIs at the "Impact analysis: Economic variables" level.

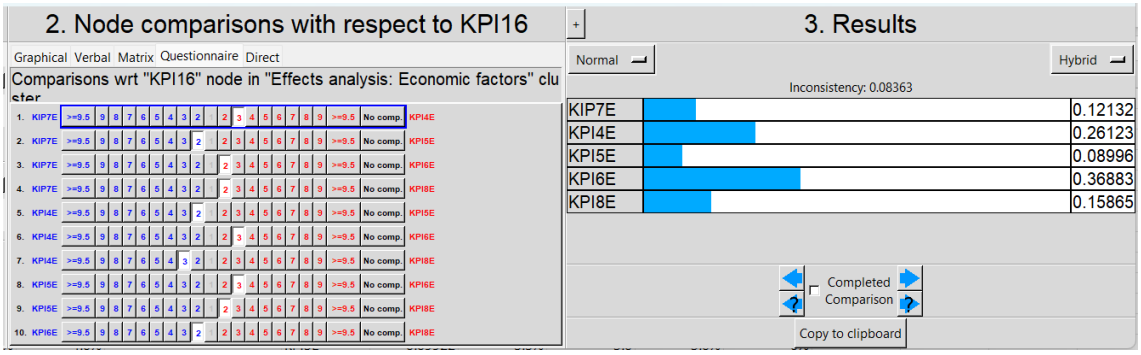
Figure 3. Pairwise comparison of the "Impact analysis" level



Source: Author's own elaboration

Step 4. For the case study, the inconsistency of each of the scores was checked. For all the scores, the CR was less than 10%. For example, as shown in Figure 4, the CR for KPI-16 (New transferable skills) was 0.08363, which is acceptable since the maximum is defined.

Figure 4. Inconsistency index of KPI-16: New transferable skills



Source: Author's own elaboration

Step 5. In this step, the weight of each KPI was calculated using the Super Decision software. Table 2 shows the final weight of each KPI. According to the AHP methodology, the KPI pairs should be compared from the first level ("Initial analysis") to the following levels ("Organisational analysis: Observation" and "Impact analysis: Economic factors"). Although the methodology establishes these weights hierarchically for each level, i.e. for each node (KPI) of each cluster (hierarchy level), the aim of this study is to determine the importance of the KPIs at the "Impact analysis" level compared to the next highest level. Therefore, these last two levels are normalised in Table 2.

Finally, the indicators with the greatest importance were found to be KPI-5.e and KPI-7.e, i.e. impact on turnover (14.1%) and impact on quality (14.8%), which indicates that SME decision makers should emphasise training related to these two KPIs, as this would improve the company's performance by almost 30%. This in turn would affect the overall performance of the organisation. Another important KPI is impact on time (11.7%), which, together with the above two indicators, would help to improve SME performance by up to 41%.

Table 2. Priorities – Overall weights of the KPIs

	KPI name	Name	Percentage
Organisational analysis: Observation	Competitivity	KPI-10	10.0%
	New competency level	KPI-15	8.4%
	New transferable skills	KPI-16	7.3%
	Work absenteeism	KPI-13	6.9%
	Internal promotion	KPI-11	6.6%
	Learning transfer	KPI-14	6.2%
	Work climate	KPI-9	2.2%
	Attrition rate	KPI-12	1.5%
Impact analysis: Economic factors	Impact on quality	KIP-7.e	14.8%
	Impact on turnover	KPI-5.e	14.1%
	Impact on time	KPI-8.e	11.7%
	Impact on productivity	KPI-4.e	5.4%
	Impact on efficiency	KPI-6.e	5.0%
	Total		100.0%

Source: Author's own elaboration

5. Discussion

The research investigated the impact of training investments on key performance indicators (KPIs) in a Chilean manufacturing SME, employing an AHP-based approach. The analysis identified relevant KPIs across three stages: initial economic factors, organisational observation, and the impact of training on the initial factors. By focusing on employee retention (KPI-5.e), product quality (KPI-7.e), and production time reduction (KPI-8.e), the research revealed the potential for training to significantly improve overall organisational performance.

The emphasis on employee retention (KPI-5.e) aligns with the work of Bramhanti et al. (2018) and Asadullah et al. (2015), who demonstrated the positive influence of training on reducing turnover. This research builds upon those findings by pinpointing specific areas like retention-focused programs, offering a more targeted approach to maximizing this impact and empowering SMEs to optimize their training investments.

Similarly, the focus on quality (KPI-7.e) echoes the insights of Phillips and Phillips (2016), who highlighted the role of training in improving manufacturing quality. The present research goes beyond this by offering a more granular perspective. Identifying skill development and process optimization training as key contributors, it provides actionable advice for SMEs to refine their training programs for targeted quality improvement.

Furthermore, the importance placed on reducing production time (KPI-8.e) aligns with the research of Curado and Bernardino (2018) and Salimian (2021), who established a connection between training and increased efficiency. This research adds specificity by suggesting that process optimization training directly impacts production time, contributing to overall efficiency gains. This targeted approach empowers SMEs to prioritize specific training areas that directly address their productivity needs.

While the results are promising, the single case study design necessitates further research with larger, diverse samples. Expanding the scope across industries and contexts would enable validation and generalization of the findings, ensuring their broader applicability.

Additionally, while the AHP-based approach provided a structured framework, future studies could explore alternative methods for enriched understanding. The Analytic Network

Process (ANP) might offer valuable insights by considering interdependencies between KPIs, while fuzzy logic could address inherent human judgment uncertainties, adding nuance to the analysis.

Finally, exploring the influence of cultural factors on training effectiveness and ROI holds immense potential. Tailoring training design and evaluation methods to specific cultural contexts could yield valuable insights, ensuring the effectiveness of training initiatives across diverse settings. This opens exciting avenues for future research, leading to a more nuanced and culturally informed understanding of training's impact on SMEs.

By comparing our findings with existing research, this paper highlights the promising role of targeted training in impacting key performance indicators like employee retention, quality, and production time in SMEs. However, acknowledging limitations and considering future research directions using larger datasets, diverse samples, and alternative evaluation methods is crucial for enriching our understanding of training ROI and its broader impact on organisational performance across various contexts and cultures.

6. Conclusions

Although there is broad consensus on the need to assess the return on investment in training within companies, often the evaluation is limited to measuring the satisfaction of the students and the individual assessment of their knowledge. This is mainly because, when designing training, there is a lack of educational planning followed by evaluating through cost analysis, performance, and the potential transfer of knowledge to the workplace.

There are many technical difficulties in calculating the return on investment in training, with the most significant obstacle in the majority of studies conducted in this field.

This paper proposes an AHP and BSC based approach for evaluating the impact of training investments on KPIs in a manufacturing SME in Chile. The analytic hierarchy is structured in three steps: initial analysis (economic factors), organisational analysis (observation) and the impact of training investment on the economic factors in the initial analysis, in terms of the key performance indicators in each step. Since the human decision-making process usually involves confusion and vagueness, a well-organised AHP information system was

constructed to make it easier. This is a first stage of research (determining the impact of training investment on KPIs), the ultimate aim of which is to determine the return on investment (second stage), which will be developed in subsequent studies based on this research.

Finally, the KPIs with the greatest impact on overall organisational performance were found to be impact on quality and impact on turnover. Therefore, SME owners should focus training initiatives on these two KPIs in order to achieve overall improvement in their organisations. This research opens up new avenues for research. For instance, other methods such as the analytic network process (ANP) and fuzzy logic should be evaluated, and the proposed approach should be applied to companies in other sectors.

Some comments and conclusions from the studied company include the following: they have pointed out that the method is difficult to understand, but they recognize the need for the staff to internalize the methodology. They have also grasped the utility of the method. Ultimately, the owner and director of the company believe that the obtained methodology appropriately represents and supports the business strategy.

Regarding the study's limitations, it's essential to note that it was confined to a single SME in the province of Rancagua, Chile, using a small sample. The findings may not be generalizable to other organisations in different provinces or sectors. A larger sample and the inclusion of participants from various organisations could have enhanced the scope of this study and the transferability of the findings.

As future research directions, exploring alternatives such as other methods like ANP or fuzzy logic is suggested. In the first case, the goal is not only to establish a hierarchical structure among indicators but to treat them as a network. In the second case, it is proposed to evaluate the decisions used in this study not only as binary outcomes but to consider that decisions may vary between these two options, establishing a range in decision-making.

Furthermore, applying this study to SMEs in different areas and other types of companies, whether medium or large, is recommended to assess the method obtained in the research.

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