The construction of a training academy - The Hovione case study

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Abstract: Aside from being the only resource that cannot be copied because its skills are unique and impossible to replicate, human capital also serves as a facilitator to ensure product quality and conformity. Given the importance of this asset, investing in people's knowledge and skills through training has gained more relevance in organizations. In addition to fostering continuous learning, professional training allows the obtainment of legally imposed qualifications, flexibility in the scheduling of human resources, and the reduction of production defects and accidents, which minimizes the time and costs of the operation. Although Hovione has a training system in place, there is a lack of standardization of the training intensity, an outdated LMS, and an excessive use of resources (time, courses, trainers). To overcome these problems, this dissertation proposes a good practice model for the design and establishment of a training academy, developed by attending to a literature review and relying on the following phases: 1) identification of competencies; 2) course and curriculum architecture; and 3) construction of the competency matrices. By implementing this model, the complexity of the existing training system of Hovione was reduced, and it was possible to define a learning path to qualify production operators, which contributed to reducing the time required by these employees to become capable of performing their work functions. Additionally, monitoring and evaluation plans that respectively measure the contribution of the training to organizational performance and the construction of the model in simplifying the functioning of the training system were proposed and validated.

Keywords: Professional training, quality, pharmaceutical industry, human capital, continuous learning, training academy

1. Introduction

In any industry, the success of companies depends on the knowledge and skills of their personnel (ISO 10015, 2019). Thus, to deal with increasing competitiveness in the markets, together with increasing customer demand, solutions to better manage these resources as well as their knowledge become essential for organizations (Costa & Neves, 2012; Armstrong, 2014). Particularly, in the pharmaceutical industry, where medical devices that directly impact human life are produced, both requirements and quality assurance are equally important. In this sense, the creation of corporate academies is becoming an effective strategy to ensure that employees have the required competencies to perform their jobs effectively and meet the specific needs of the company (Costa, 2019). This approach allows employees to learn how they should operate under the requirements and regulations for developing their work. Similarly, training can be customized and specifically targeted for a certain job.

This paper describes a case study of a Portuguese company from the pharma industry, called Hovione. The case illustrates the roadmap to design and launch a training academy focused on operations (which includes the areas of manufacturing, operational excellence, logistics and warehousing, maintenance and engineering, and supply chain) capable of providing its employees with the necessary knowledge and skills to effectively perform their job, as required by good manufacturing practices (GMP).

2. Literature review

2.1. The importance of Human capital

According to Dimov (2017), human capital refers to the sum of knowledge and skills arising from education and experience that can be used to benefit of firms. This advantage is associated with the creation of value that people can bring to companies through their ability to transform and acquire knowledge (Armstrong, 2014). In this sense, human capital is the only resource that cannot be copied. So, with successive technological advances, dependence on this type of asset has been increasing over time (Bontis, 2001; Ceitil, 2016). This reality can become even more critical in patent-producing companies that are more vulnerable and dependent on the development of knowledge (Alpkan et al., 2010; Huang et al., 2011; Mehralian et al., 2013; Schneider et al., 2015). Nevertheless, human's knowledge on its own does not serve as sustenance for organizations. In this sense, seeking to cultivate and disseminate this knowledge is also a decisive factor, since it is what allows companies to adapt to the evolutionary changes in markets (Armstrong, 2014). Thus, organizations often realize the need to invest in training as well as its continuous improvement over time in order to enhance the capabilities of individuals (Almeida et al., 2008).

2.2. Training management

It is also critical that companies do understand how training should be developed to meet their needs. A good strategy for that purpose may be to understand the standards related to training in the field of quality management. In the specific case of the relevant international management system standards, ISO 10015:2019 provides guidelines to manage the training processes by considering five sequential stages: 1) Identification of training needs; 2) Planning and construction of a training program 3) Training implementation; 4) Evaluation of results; and 5) Continuous improvement (ISO 10015, 2019). In this way, and with these guidelines in mind, the

mentioned standard guides companies to design, implement, and sustain an effective training system regarding all its components (Chang & Chen, 2013). Complementary to the mentioned standard, both ISO 30401:2018 and ISO 10018:2012, which respectively refer to knowledge management requirements and guidelines for engaging people, are also relevant in this context.

2.3. Learning Tools

To assist and guide training activities, there are a set of tools available. As is the case of the competency matrix, which identifies, specifies, and visually displays a set of key information about the existing levels of competencies among the members of a team to perform a job, task, or process (Kuruba, 2019). Furthermore, it can be useful for the identification of skills' gaps and training needs, as well as for improving the allocation of personnel to tasks (Kuruba, 2019; Wang et al., 2021).

On the other hand, learning management systems (LMS) stand out regarding the implementation and delivery of training sessions. Since these systems provide a set of important statistics that serve to improve and personalize educational experience, they also work as a content repository of courses' materials, which enables a better connection between trainees and trainers (Cavus et al., 2007; Lwande et al., 2021). Once it is assured that the programmatic contents are coherent with the stated learning objectives and that the LMS platform is simple to use, then the whole potentialities that such tool can provide can actually be achieved, allowing the desired knowledge transmission (Thepwongsa et al., 2021).

2.4. Evaluation of the learning process

Several methods can be used to evaluate the learning process. The most well-known was conceived by Kirkpatrick (1994), who defines this evaluation into four levels: 1) Evaluation of the trainees' reactions; 2) Evaluation of knowledge retention; 3) Evaluation of behaviors; 4) Evaluation of the results (contribution of training activities to value creation). In addition to this method, Tamkin et al. (2002) suggest alternative evaluation methods that can be divided into two groups: those that focus on the evaluation objective and those that provide alternative evaluation measures.

2.5. Quality: Role in the pharmaceutical industry

In an industry in which manufactured products' quality have a significant impact on human health, the ability for effectively manage the competencies of their personnel is critical for all pharmaceutical enterprises. Therefore, the role of quality assurance is very important. According to the World Health Organization (2007), quality assurance refers to the set of actions that certify that the quality of pharmaceutical products constantly comply with the applicable standards. To ensure that this quality is maintained, one option may include following good practices (GxP) that, through their principles, can guide companies to always produce the same quality standards. Some studies have been conducted in order to prove that adherence to these standards consequently results in improvements. As is the article by Eich & Friedli (2021), which concluded that, in general, companies that invest in operational excellence, specifically in quality management systems, are more likely to show favorable results in inspections. Furthermore, the study by Narhi et al. (2022) refer that the handling and transportation of medical substances are impacting factors on the quality and safety of medicines. This indirectly reflects the importance of following GDPs integrated into a quality management system, which prevents the quality and efficacy of products from being compromised. Given these studies, it is concluded that standards should be valued because, combined with the correct training provided, they enable the delivery, regardless of the reality experienced, of consistent products in terms of quality (Elsafty & Osman, 2021).

3. Hovione case study

Hovione was founded in 1959 by chemical engineer Ivan Villax, Nicholas Horthy, and Andrew Onody. This company stands out in the market for its chemical development, which unfolds in three main manufacturing stages: chemical synthesis, particle engineering, and drug formulation. Therefore, Hovione produces and deals on a daily basis with substances and products that can be dangerous to the lives of its workers and customers. To monitor whether the company is capable of manufacturing products in compliance with the applicable requirements, they are frequently audited. Since GMP requires that personnel must be competent in the work they perform, this is of course one of the audit criteria that is regularly verified during audits. In this sense, and especially in the pharma industry, all activities that impact the qualification of the workers are extremely relevant and need to be properly recorded.

3.1 Current situation context

Hovione has a training management system in place. The qualification of the personnel is a process that comprises two parts: 1) The realization of general training, designated as onboarding, that occurs every month, which aims to address all the general but fundamental information that any employee needs to know or be aware of to work for Hovione, regardless of his/her job function; and 2) Specific training, which, on the other hand, depends on the person's role and job description. For the latter, for employees to be qualified, direct managers must choose from a set of existing courses those that they consider relevant for employees to do their job. Therefore, this phase of the training system works for all employees in a decentralized way. After these courses are attended by the employees, a theoretical test, which evaluates the retention of knowledge, is held. In particular, employees whose technical positions are related to manufacturing/ warehousing operations will also attend a school of operators that occurs every two months for five weeks, where the most fundamental and basic operational concepts are addressed. For these cases, in addition to the ordinary evaluation method, there is also a behavioral evaluation that occurs three months after the person started working in the operational area. Thus, obtaining the qualification for these operators will depend on subsequent evaluation and approval by direct managers.

This process occurs on average once a month whenever a new employee joins Hovione. In the case of employees who are already in the company, the

acquisition of qualifications depends on the training needs that arise during his/her career. This means that there is no clear training path for these personnel.

To support this qualification process, Hovione has in place a learning management system (LMS) named Trainstream, where evaluations and knowledge assessments are recorded, training support documents are stored, and other data necessary for qualifications' tracking are placed.

3.2 Problem´s diagnosis

A set of overlapping analyses, taking into consideration the interviews held and the data gathered from the LMS, revealed that the current problems of the Hovione training system are, essentially, associated with: 1) The outdated LMS; 2) The lack of standardization of training intensity; 3) The excessive use of resources (time, trainers, facilities); and 4) The inadequate training model architecture. Furthermore, quantitative data collected from LMS revealed that a total set of 4400 courses exist, which creates obvious constraints to the daily management of the training stream.

Table 1 summarizes a collection of problems that arise from the current training management system. Attending to this, Hovione decided to start a strategic project with the aim of redesigning the whole training management system, including its processes, course contents, and LMS.

4. Proposal and validation of the good practices model

4.1. Proposed good practices model

It is important to note that no integrated approach for the creation of a training academy completely appropriate to Hovione's reality was found in the literature. In this sense, to respond to the problems previously described, a new model was developed, combining a set of relevant scientific contributions and translating them into good practices that are organized around the logic provided by the PDCA cycle (Gu et al., 2021). The methodological steps adopted for the design, development, and launch of the academy were aligned with that 4-stage cycle. The proposed model comprises the following stages: planning, construction, implementation, evaluation, monitoring and continuous improvement.

1st Phase - Planning: Planning the academy

In this first phase, it is important to align the project planning with the objectives and needs of the company, as referred in the 4.2 clause contained in the ISO 10015 (2019) standard. This clause underlines the importance of understanding the organizational context through the identification of training needs to increase the ability to run competence management and people development processes in an enterprise. After this, research conducted by Kuruba (2019) highlights the importance of setting business organizational objectives in a clear way so that, based on them, it is possible to define specific action plans to meet the training needs previously identified. Afterwards, it was also important to define the applicability scope for these action plans. This was done in line with the guidelines provided by the clause 4.3 of ISO 30401 (2018) for knowledge management systems (KMS). This clause underlines the importance of defining learning priorities as part of the business continuity strategy to better define the applicability scope of the KMS. To meet this phase's goals and attending to the mentioned literature, the following best practices (BP) are herein proposed:

BP1. *Identify organizational training requirements based on the current organizational context;*

BP2. *Define action objectives based on the identified training needs, while keeping the vision and mission of the organization in mind;*

BP3. *Define the scope of applicability of the academy considering the priority knowledge domains in business continuity.*

2nd Phase – Execute: Building and developing the academy

For this phase, the following main aspects should be considered: 1) Identification of competences; 2) Training plan architecture and 3) Stakeholders' involvement. According to Kuruba (2019), the process associated with the identification of competencies should follow the following steps:

- Identify roles and describe them – regards the definition and the understanding of the organizational structure, its job functions, and their associated responsibilities.
- Identify the necessary competencies – concerns the identification, definition, and specification of the competencies for the personnel to perform their job effectively.
- Typify competencies by levels – regards the typification of competencies by proficiency levels.
- Allocating competence levels to job functions – it is related to the assignment, for each job role, of the degree of competency that is required.

Regarding the training architecture and planning process, the following points derived from clauses 5.2 and 5.3 of ISO 10015 (2019) were considered:

Table 1- Cause and impacts of the problems diagnosed

Cause	Problem	Impact
Obsolete LMS / LMS stores a lot of information	Hard-to-use LMS / Mismatch between existing Trainstream courses and the courses used	Less dynamic training / Negative learning experience / Complexity of working and extracting data from the system
Easy access to creating courses arbitrarily	The existence of numerous redundant courses	Unnecessary consumption of time and facilities
Lack of clarity in identifying what employees need to achieve throughout their career	Lack of knowledge about people's qualifications and their respective evolutionary processes	Inappropriate employee allocation management / Training activities do not follow career development
Dependence on the allocation/creation of courses to direct managers	Decentralization in the creation/allocation of courses	Errors in curriculum allocation / Delay in allocation of training plans
Delay in allocation of training plans / Creation of courses without link to competencies	Manual qualification of employees	Reliability of the personnel qualification indicators compromised
Utilization of qualified trainers to perform generic training	Use of human resources unnecessarily	Excessive time spent on activities that do not add value
Dependence on the creation/allocation of courses to national direct managers	Lack of training standardization between Hovione sites	Demotivation of workers / Lack of uniformity within the company
Numerous product, equipment, and building-related courses	Poor adaptability of operators between productive areas	Increased adaptation time / Poor employee turnover among areas

- Detailing the training program – it is related to the definition of the specific ideas and objectives for the training.
- Select the training method – it involves the selection of the most convenient training method for each formative activity.
- Select the trainer – it concerns the identification and choice of the trainer with the appropriate profile and set of skills.
- Select the evaluation method - it refers to the suitability of the type of evaluation capable of validating the achievement of the learning objectives established in the training program.

Kirkpatrick (1994) proposes an additional method for evaluating formative activities, which consists of evaluating training at three levels: reaction, knowledge, and behavior.

Furthermore, all the stakeholders impacted by the project need to be involved from this stage. This must be done in line with the guidelines provided by the clause 4.2 of ISO 10018 (2012). This clause suggests that strategies are defined to ensure the commitment of those involved in the project. So, considering all these contributions, the following best practices are identified:

BP4. *Identify all roles and associated responsibilities;*
BP5. D*efine, specify and identify the competencies required for the development of the organizational operations;*
BP6. *Assign proficiency levels to the competencies identified;*
BP7. *Identify the required level of proficiency for each job function;*
BP8. *Create courses, define their compulsory nature and their respective contents aligned with the competencies previously identified;*
BP9. *Adapt the method of content transmission to the type of training provided;*
BP10. *Choose the trainer according to their qualifications and skills*;
BP11. *Select the best assessment method according to the type of training and its goal;*
BP12. *Involve the project stakeholders to ensure their commitment.*

2nd Phase – Execute: Academy implementation and functioning

This stage strongly relies on the competency matrix tool. According to Kuruba (2019) and Wang et al., (2021), this matrix supports the identification of individual training needs as well as the allocation of personnel to tasks, hence guiding the design and implementation of the corporate academy. Additionally, regarding the establishment and delivery of training plans, clause 5.4 of ISO 10015 (2019) is also herein considered. From this, the following good practices emerge:

B13. *Build competency matrices to facilitate the process of identifying qualification gaps;*
B14. *Ensure that all employees attend the set of courses appropriate to their qualifications.*

3rd Phase - Check: Assessment

This phase highlights the importance of evaluating the results arising from the functioning of the academy, which serves to understand how training has contributed to value creation in the business through performance improvement. For this aim, the contributions of Kirkpatrick (1994) and ISO 10015 (2019) were considered. The former proposes a method for evaluating the results in terms of training effectiveness, while the latter highlights in its clause 5.6 the importance of assessing the impact of the training activity. The resulting good practice for this phase is following:

B15. *Evaluate the contribution of training activities in the long and short term through the use of proper key performance indicators.*

4th Phase - Act: Monitoring and continuous improvement

The continuous improvement step closes the PDCA cycle inherent to the proposed 4-phase model. To set this phase's best practices, requirements under the clause 5.7 of ISO 10015 (2019) were considered. In this clause, it is implied that opportunities for improvement should be sought on a continuous basis, according to the identification of future training needs:

BP16. *Continuously strive to improve training activities by actively responding to the needs identified*.

4.2. Model validation

To validate the proposed model, semi-structured interviews were conducted with company training specialists. For that aim, three selected interviewees (whose functions are: senior learning and development specialist, trainer in productive areas, and trainer at the school of operators) were asked the same set of questions:

Q1) What do you think about the model proposed? Is it useful considering the company's needs?
Q2) Do the good practices established cover everything that the design, development, and implementation of the academy involves? If not, what would you include in the model?
Q3) Would you eliminate any good practices that you believe are unnecessary?

Given the answers obtained from the interviews, it was possible to conclude that the proposed model is useful and suitable to be employed during the planning, construction, and implementation stages of the academy. However, to ensure that the model is aligned with the company's needs, it was suggested to include the following: 1) A good practice to foster stakeholder engagement during the development stage of the academy; 2) The clauses of the ISOs mentioned. As shown in the previous section, these suggested adaptations were incorporated into the model.

5. Application of the model to the case study

The good practices, presented in this section, are those which were implemented during the internship carried out by the author of this paper to help in the design and construction of the Hovione operations academy.

1st Phase - Planning

BP3 – The good practices model will focus on the Hovione operations academy, which includes the areas of manufacturing, operational excellence, logistics and warehousing, maintenance and engineering, and supply chain. These areas directly contribute to the on-site operational flows, thus to the products' value streams. In parallel, it is in these areas that most of the trainers are nearing retirement age and most of the courses exist. Taking into consideration those aspects, the development and

launch of this academy was considered a priority. To design and implement this academy, learning and development specialists allocated a multidisciplinary team, of which the author of this paper is part.

2nd Phase – Execute

BP4 – This best practice involved a conjoint work between the Human Resources (HR) department and the area managers to identify the different responsibilities associated with each job function. Once the positions were defined at the organizational level, it was the responsibility of the project team to know the type of functions covered in the operations academy.

BP5 – In line with the fifth best practice, the project team proceeded with the determination of the required competencies that personnel should have to perform their job tasks. For this aim, the project team only considered relevant, from the categorization framework proposed by Kuruba (2019) the competencies specific to the business unit (operations) and those that are inherent to each role.

Business unit skills identification – These sorts of competencies were identified by conducting a set of workshops with departmental directors, being then organized around affinities using the K-J method, also known as affinity diagram, which is a quality planning and management tool (Kawakita, 1991). To avoid considering competencies related to other areas, the in-scope/out-of-scope tool was adopted (Mochal & Mochal, 2011).

Identification of specific competencies for each job function – Considering all the areas covered by the operations academy, the project team was faced with a wide set of organizational functions with very different required competencies. The manufacturing area responsible for producing active pharmaceutical ingredients (API), internally known as ChemOps, was chosen in the scope of this research, as the competencies required in this department are, in their majority, common to other productive areas. The job function "operator" was chosen because it represents more than 50% of the personnel to be covered by the Operations Academy and is also the function with the greatest need for training. For the identification of the specific competencies for this function, it was necessary not only to monitor production processes and associated production sheets but also to obtain the assistance and approval of team leaders and area managers.

BP6 – Adapting the levels proposed by Kuruba (2019), the project team established the following five levels of proficiency: Level 0 denotes the absence of the necessary skill or competency. Level 1 requires basic skills, which translates to the need for supervision during work. Level 2 is assigned to an employee who can work autonomously. Level 3 is achieved when an employee masters a certain competency, demonstrating ability to perform a task in any circumstance. Finally, at level 4, the employee not only is an expert but is also able to train. Furthermore, it was defined that fundamental competencies are associated with level zero, and more specific competencies can be associated with levels 1 to 4, depending on the functions and responsibilities of the jobs.

BP7 – The level of proficiency allocated to each specific competency may vary depending on the job function of an employee. The criteria for assigning skill proficiency levels to each job function were based on the team leaders' judgement.

BP8 – To facilitate the creation of courses for the operations academy the guidelines described below were followed by the project team. The competencies identified were allocated to the following course formats:

1) Fundamental training – Courses designed with the aim of providing general knowledge regardless of the type of operational role performed.

2) Operational training – Types of training that provides process-related courses for a specific job family.

3) Task training – Courses intended to provide specific skills to perform a specific task in an effective manner.

These courses can be of a mandatory, required, or optional nature. Mandatory courses are those where legal or regulatory requirements are involved. Required courses are those that must be taken at the company's internal request, and optional courses are those that may or may not be taken at the employee's will.

The courses were defined according to the three formats previously described:

Fundamental training – A single course, named "Fundamentals of Operations developed at Hovione", was defined for this training layer. It addresses three main topics: 1) Manufacturing sites; 2) Operations-related areas; 3) Operational processes. The selection of the syllabus for this course attended to a set of sources of data, including: existing training documentation and meetings held with trainers from different operational areas.

Operational and Task Training – Focusing on the ChemOps manufacturing operators job function, a total of eight courses were defined. These courses derived from the clustering of the specific competencies using the affinity diagram, also known as K-J Method. To produce the required training material to support the defined training content, the project team took advantage of the training documentation available in the current LMS.

BP9 – The transmission modes for each course were defined to suit the following set of variables: its learning objectives, the size of the target audience, and the desired degree of interaction with the trainee. In this sense, fundamental courses should be given in e-learning since they aim to cover theoretical and generic concepts for a wide set of collaborators. On the other hand, for operational courses, a mix of three training types was defined: 1) E-learning courses to provide basic and specific theoretical knowledge related to production activities; 2) Face-to-face classroom for a mixed theoretical-practice training and 3) on-the-job training to test and reinforce, in work practice, the theoretical content previously learned. Finally, for task courses, where specific practical knowledge is transmitted, only on-the-job training is applicable.

BP10 – In order to select the most suitable trainer for a specific course, the project team established the following rules:

1) Establishment of the ideal profile of a trainer: Be an expert on the subject to be taught (proficiency

level 3 or 4), have excellent communication skills, and be enthusiastic about training.

2) Definition of the trainer qualification process: If the requirements of the ideal profile are identified by a team leader, the employee qualification will be composed of an interview followed by specific training, including both behavioral training and a train the trainers session for any specific course to ensure standardized practices among trainers.

BP11 – Based on the model proposed by Kirkpatrick (1994), the following evaluation methods were defined: 1) Training reaction questionnaires; 2) Quizzes or multiple-choice tests (theoretical tests) to assess knowledge retention in theoretical courses. 3) On-the-job observations to assess behavioral change when performing a task. Thus, considering the proficiency levels and the evaluation methods established, the project team defined the scheme illustrated in Figure 1, representing the process of progressing over the proficiency levels.

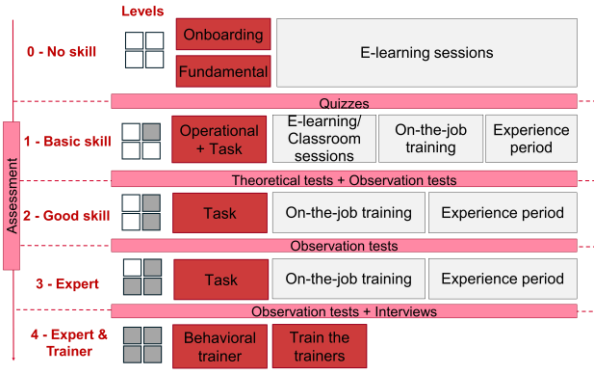

Figure 1 - Process of progression over proficiency levels

BP12 – In order to involve directors, managers, and other key internal stakeholders, as stated in clause 4.2 of ISO 10018:2012, workshops and regular meetings were often held. To evaluate the stakeholders' satisfaction with the project and the usefulness of those meetings and workshops, the following tools were respectively, used: 1) Net Promoter Score (NPS); 2) Return On Time Invested matrix (ROTI). The NPS value measures the degree of commitment of those involved in the project through a questionnaire (Baehre et al., 2022). The ROTI matrix allows the measurement of the degree of return that an employee has compared to the time and effort invested (Loeffler, 2018).

BP13 – To guide the implementation phase of the academy, the utilization of a competency matrices to identify existing training gaps and to manage the allocation of personnel to job tasks are of key importance (Kuruba, 2019; Wang et al.,2021). Taking into consideration the information that a scheduler needs to take from this matrix (individual ability and existing proficiency to perform a specific task), the model proposed and validated in the company is illustrated in Figure 2:

		Skills						Skill/name proficiency
		Fill a batch production sheet	Clean properly an equipment	Carry out a leak test	Sanitize na equipment	Take a sample	Perform a calibration	
Name of collaborators	Manuel							46%
	António							67%
	Maria							38%
	Alice							33%
	Ricardo							42%
	João							50%
Skill/Task proficiency		42%	54%	38%	42%	42%	58%	

Figure 2 - Competency matrix for a Chemops production operator

In this project, and attending to the reality of Hovione, it was decided that the competency matrix would only include the task-related competencies. This simplifies the matrix and avoids its extension.

BP14 – To be able to meet all required qualifications from a GMP perspective a standard curriculum for each job function is intended to be created. This will be facilitated since the identification and allocation of competencies in courses has already been done, being sufficient to identify the knowledge/tasks associated with the skills required, check in which course they are covered, and build the curriculum by adding the course in question. This is also applicable when training gaps are identified through the competency matrix. Using this logic, it was possible to build the curriculum for a ChemOps production operator. Additionally, to ensure that employees are qualified for the most recent version of the courses, a standard process for changing and allocating courses was proposed and validated.

3rd Phase - Check

BP15 – As suggested in ISO 10015:2019, the evaluation of the training impact should be carried out at this stage. For that purpose, the following sequence of steps was adopted:

1) Identification of key performance indicators (KPIs) – Considering the principles for KPIs definition according to ISO 22400:2014, together with the evaluation parameters purposed by the ISO 10015:2019 and Kirkpatrick (1994) to infer the impact of training activities on organizational performance, the following KPIs were proposed:

1. Rate of non-conformities related to training:

$$\left[\frac{Non-conformities\ related\ to\ training}{Total\ number\ of\ non-conformities}\right]*100$$

2. Production process yield rate:

$$\left[\frac{Number\ of\ products\ correctly\ produced\ at\ the\ first\ time}{Total\ number\ of\ products}\right]*100$$

3. First time pass rate:

$$\left[\frac{Number\ of\ first-time\ approvals}{Total\ number\ of\ approvals}\right]*100$$

2) Validation of KPIs – To validate the suggested indicators, interviews were conducted with members of the project team. One could conclude that the mentioned KPIs are representative of the intended

improvements, hence susceptible to adoption in the future.

3) Monitoring plan – Due to time constraints that prevent the full academy implementation, the calculation of the proposed indicators was not possible to perform. However, to measure the contribution of training to organizational performance, a monitoring plan was established. So, for this purpose, it is suggested to the company to measure the indicators, respectively: 1. whenever there is an audit; 2. with the natural frequency of measurement in the company (weekly); and 3. whenever there are moments of evaluation. These indicators should be regularly monitored in order to assess their relationship with the training activities delivered. If the KPIs oscillation is close to the moments of allocation/frequency of training activities, it can be deduced that training has a positive impact on organizational performance, or on the other hand, can reveal a need to update training courses. According to the PMI (2017), the project team members, together with personnel from departments where these metrics are useful, should be responsible for measuring and monitoring these performance indicators.

6. Results

This section of the paper aims to assess how the proposed model contributes to simplifying the training system. That assessment is organized around the following categories: i) Trainee's learning path; ii) Training management system; iii) Trainee motivation. So, in this section, the characteristics of the model that may have an impact on each of the categories are presented. In cases where it is not possible to quantitatively demonstrate the influence of the model (due to the incomplete implementation of the academy), a set of indicators that compose an evaluation plan that should be measured after the implementation of the academy are presented.

i) Impact on the trainee's learning path

(1) Creation of courses based on the identification of competencies: Because all training courses are directly derived from the actual competencies' identification, redundant topics and training sessions could be eliminated and avoided, thus leading to a reduction in the number of courses and required training hours. Once the training plan for ChemOps production operators was established, it was possible to assess how the model contributed to simplifying these trainees' learning path. To measure the impact of that simplification, the following metrics were useful:

4. Course reduction rate:

$$\left[\frac{Number\ of\ courses\ \ (after) - Number\ of\ courses\ (before)}{Number\ of\ courses\ (before)}\right] * 100$$

5. Reduction rate of hours spent exclusively on training:

$$\left[\frac{Hours\ spending\ in\ training\ \ (after) - Hours\ spending\ in\ training\ (before)}{Hours\ spending\ in\ training\ (before)}\right] * 100$$

In this regard, to obtain the data associated with the calculation of these performance indicators, it was necessary to compare the courses and hours of training required for ChemOps operators before and after the model's implementation. Tables 2 depict the before and after values for these data.

Table 2 - Data collected before and after the academy implementation

Data	Before	After
Number of courses/modules	77	20
Number of hours spent exclusively in training	137.25	45.5

Table 3 - Performance indicators

Performance indicators	
Courses reduction rate	74%
Reduction rate of hours spent exclusively on training	67%

These results reveal that the new training model contributed to reducing the time that an operator spends exclusively on training activities. As a result, the time required for these employees to obtain the qualification is also expected to be reduced.

(2) Creation of operational courses: The development of operational courses where similar points are identified between the different manufacturing areas, with slight differences among curricula, allows to provide operators with a more general knowledge. This consequently contributes to enhance flexibility and polyvalence of production operators. In this way, it is expected that the time of adaptation and for obtaining qualification in other productive areas will be reduced. In this scope, the following key performance indicator was proposed:

6. Rate of reduction of time to obtain the qualification in another productive area:

$$\left[\frac{\begin{array}{c}Time\ spent\ in\ obtaining\ a\ qualification\ in\\ another\ productive\ area\ (after) -\\ Time\ spent\ in\ obtaining\ a\ qualification\ in\\ another\ productive\ area\ \ (before)\end{array}}{\begin{array}{c}Time\ spent\ in\ obtaining\ a\ qualification\\ in\ another\ productive\ (before)\end{array}}\right] * 100$$

ii) Impact on training management system

(1) Competency matrix construction: According to Wang et al. (2021), a competency matrix facilitates the process of scaling human resources to job tasks. In this regard, it is predicted that personnel resource planning will be more efficient through the creation of a competency matrix capable of visually displaying who is qualified to perform a certain job and who is not. The following KPI is proposed to track whether the scheduling time was reduced or not due to the adoption of competencies matrix:

7. Rate of reduction of time spent in scheduling human resources:

$$\left[\frac{\begin{array}{c}Time\ spent\ in\ scheduling\ human\\ resources\ (after) -\ Time\ spent\ in\\ scheduling\ human\ resources\ (before)\end{array}}{\begin{array}{c}Time\ spent\ in\ scheduling\ human\\ resources\ (before)\end{array}}\right] * 100$$

(2) Curricula standardization: With the application of the model, it is intended to identify and group the competencies associated with each job function into courses based on existing thematic affinities. With this in mind, a training plan can be directly assigned to each employee in a standardized way. Consequently, it is then expected that the time that direct managers spend on developing and managing the training plans of their personnel can be reduced.

The following KPI was established to monitor if this hypothesis can be confirmed:

8. Rate of reduction of time spent on managing the employees' training plan:

$$\left[\frac{\begin{array}{c}Time\ spent\ on\ managing\ the\ employees\\ training\ plan\ \ (after) - Time\ spent\ on\ managing\ the\\ employees\ training\ plan\ \ (before)\end{array}}{\begin{array}{c}Time\ spent\ on\ managing\ the\ employees\\ training\ plan\ \ (before)\end{array}}\right] * 100$$

(3) Transition from classroom to e-learning courses: For theoretical courses where basic knowledge is taught and the target audience is massified, it was decided that the e-learning format would be the better option. Two of the greatest advantages of this option rely on the fact that trainers can be allocated to other activities with more added value, and facilities used unnecessarily can be released. Through the creation of the training plan for the ChemOps production operators, it was observed that the rate of courses transmitted through e-learning increased 21 percentage points (9% to 30% of the total number of courses). These values show that the rules previously established are being considered for the architecture of the courses, which indicates that the expected result, regarding the release of trainers, shall be confirmed. To monitor whether this expectation can be achieved or not, the following metric is suggested:

9. Rate of reduction of time spent by trainers on training:

$$\left[\frac{\begin{array}{c}Time\ spent\ by\ trainers\ on\ training\ (after) -\\ Time\ spent\ by\ trainers\ on\ training\ (before)\end{array}}{\begin{array}{c}Time\ spent\ by\ trainers\ on\\ training\ \ (before)\end{array}}\right] * 100$$

iii) Impact on the trainee motivation

(1) New LMS: The company considered relevant the implementation of a new LMS to support training management activities. Compared with Trainstream, the new LMS will allow a wide set of new functionalities, including the introduction of training content in video format and a more robust and accurate management of professional qualifications. It is expected that these aspects will improve the learning experience of the employees, thus contributing to their motivation.

(2) Clarification of the curricula and learning path for an employee: With the assignment of a proficiency level per employee function, as well as with the setting of rules for progressing over the proficiency levels, it became possible to define learning paths, making clear what is expected from each worker, at each moment, according to his/her function. Furthermore, the visual display provided by a competency matrix also encourages every worker to improve and to be continuously motivated to attend training while progressing through his/her career.

(3) Continuous learning culture creation: Due to the fact that it is intended to provide training along every working path, the company eliminates the time lag between content delivery and application allowing a consistent people development throughout his/her internal career. Furthermore, by making all courses available to everyone, the company provides its employees with the opportunity to enrich their knowledge whenever the need arises during their career. As a result, the creation of a continuous learning culture can have an impact on people's motivation.

To confirm whether, after the implementation of the academy, the characteristics of the model previously mentioned will be reflected in the motivation of the trainees, it is suggested to the company to carry out a questionnaire before and after the academy implementation takes place. To assess the level of motivation of employees, taking into consideration the answers provided in the questionnaire, the NPS tool mentioned by Yaneva (2019) is suitable.

7. Conclusions

Hovione executes a variety of main and support tasks to manufacture products that can be dangerous to the lives of its workers and customers. In this sense, continuous training in this organizational context is vital since it allows to guarantee product quality and worker safety, reducing defects and accidents in production, which minimizes time and costs while increasing the quality of the operation. Additionally, to comply with a set of legal requirements, it is also necessary to prove that employees are qualified to perform their work. Therefore, the role of a training academy, namely at the operations level, which enables the establishment and recording of employee qualifications, becomes crucial. Considering the interviews held and the data gathered from the LMS, it was possible to conclude that the training system currently in use does not meet the qualification requirements with the efficiency that is expected by the enterprise, once it functioning, reveals the following problems: 1) An out-of-date LMS; 2) A lack of standardization in the company's training intensity; 3) Excessive use of resources (time, courses, facilities, trainers); and 4) An inadequacy in the training model architecture. All these aspects have contributed to increasing the complexity of the training system, which is time-consuming (for trainers, trainees, and managers)and intensifies employee demotivation. At the same time, the literature review that was undertaken revealed the lack of an integrated approach for designing and developing a corporate training academy capable of attending to the company's problems. In this sense, to fill the company's needs, this paper proposes a new model that relies on a set of good practices that were derived from the literature to guide the design and implementation of a training academy. The good practices were organized around a sequence that is aligned with the PDCA cycle. The model was then validated. For that purpose, a series of interviews with experts from the company's training area were conducted. The model was tested in the API (active pharmaceutical ingredient) manufacturing area, known as ChemOps. The results of the case study show a reduction of 74% in the number of courses and 67% in the hours exclusively spent on training. Despite the fact that the corporate academy is not fully launched, preliminary results are promising since they already show that through the model it is possible to create training plans that reduce the time for production operators to be qualified, making them more quickly available to perform their work (activity of greater added value). In this way, one can conclude that the model suits the business's needs regarding training once it contributes to the reduction of the training system complexity while allowing the

achievement of the qualifications required at GMP level. In addition to this, it is expected that the following results can also be achieved:1) Release of trainers for the execution of higher-value activities; 2) Reduce the amount of time spent on managing training plans; 3) Decrease time spent in planning and scheduling human resources to tasks; 4) Reduce adaptation and qualification time in other productive areas. An evaluation plan, with specific key performance indicators, was suggested to confirm whether the expected results could be obtained or not after the total academy implementation. Additionally, to evaluate the contribution of the training activities to the organizational performance, a monitoring plan was also developed.

8. Suggestions for future work

After the implementation of the academy, it would be interesting to measure how the transformation of some courses from a traditional classroom format to e-learning impacts the commitment of the personnel to the new training system. According to Cerezo et al. (2016), the use of this type of approach may require greater commitment and control from an individual. In parallel, it would be beneficial for Hovione to conduct a survey to estimate the proportion of employees who left the company after being trained, before and after the implementation of the new training model. This would be necessary to determine if the new training system has a greater capability to retain employees in the company. This would also allow the assessment of the organizational risk of knowledge loss exit mentioned by Olander et al., (2015). In addition, it would make sense in the future to apply the proposed model to other organizational contexts, particularly in companies where the turnover of employees is high and therefore where the need for training efficiency is even more relevant.

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