International Journal of Advanced Engineering and Management Research

Vol. 7, No. 01; 2022

ISSN: 2456-3676

Valuation of Risk Management in Construction Projects Through the Use of Feedback Mechanisms

Ghafiki Kaoutar[1]*, Kissi Benaissa[1], Aaya Hassan[2], Zine Eddine El imam[2]

[1]ENSAM, laboratory ISPS2I, University of Hassan II, Morocco

[2]International University of Casablanca, Morocco

doi: 10.51505/IJAEMR.2022.7102 URL: http://dx.doi.org/10.51505/IJAEMR.2022.7102

Abstract

Experience feedback data can have different types depending on the civil engineering sector for example experimental measurements, expert information, visual observation, these formats can provide several different practices for capitalizing on experience feedback, processing and finally valuation of the information capitalized for the diagnosis.

The current article addresses the application of experience feedback to construction sites. As we shall argue, if the concept of experience feedback is applicable it would appear that the devices implemented in the construction sites are not taken into consideration and that, consequently, this sector faces significant risks.

This present study enables us to propose an approach to improve experience feedback by taking into account the existence of different practices in a construction site. We shall argue that the implementation of a safety case makes it possible to promote the creation of a communication link between community of practice centered around experience feedback (REX) which systematically promotes the improvement of the practice of this device.

Keywords: Feedback; risk management; community of practice; construction site

1. Introduction

Feedback is an essential element of progress for any organization and its implementation must be systematic after an exercise or an event. By using feedback, we will be able to have better framing, better planning and most importantly a clear vision of the risks with their respective solutions through the problems encountered in past projects.

The practice of operating experience feedback (REX) is common in many economic sectors and particularly in the building sector. In civil engineering, construction projects are complex operations, risk factors are of multiple sources. Hence, the present work integrates a new action in the field of construction, namely, feedback. Based on this observation, we will focus on the development of this method with the aim of improving the risk management process in construction projects by using an experience feedback system which should be a logical part progress and continuous improvement.

Vol. 7, No. 01; 2022

ISSN: 2456-3676

Indeed, it appears that the primary function of the worksite experience feedback system is to facilitate the pooling of the experience acquired by several sites and take advantage of it using a directly operational tool. Therefore, this feedback constitutes an aid to risk analysis by offering the users data which they would have difficulty accessing otherwise.

However, experience feedback is only one of the means of formalizing and capitalizing on field experience useful for risk analysis.

Therefore, we propose to use the experience feedback to collect field experiences and create/establish a library of risk scenarios which the users can rely on carry out their own risk analysis.

In this regard, our study aims to develop an experience feedback system in high-risk organizations (construction company) by reducing the risks to a minimum level identified and acceptable for the companies in charge of the project to promote the reproduction of a performance, to be in a process of risk prevention and to ensure continuous improvement.

Contribution of experience feedback to risk management

Experience feedback has become a necessity in risk management due to the essential role it plays in the identification of dysfunctions and associated solutions. In addition, this method is a source of knowledge, learning and training.

We will therefore first define what experience feedback is. Secondly, we will show how experience feedback can contribute to the improvement of the risk management process, which will lead us systematically to detail this process.

In this part we propose to give a definition of Feedback. First of all, we have to see Feedback as an open system that constantly interacts with its environment. The lived experiences are inputs into the system and the outputs are the learning that we receive and that we reuse in the process.

To define the concept of Feedback, we have retained that proposed by (Rakoto, 2004) describing Feedback as « a structured process of capitalization and use of information resulting from the analysis of positive and/or negative events. It implements a set of human and technological resources that must be managed to help reduce the repetitions of errors and promote certain high-performance practices ».

Feedback is therefore a tool for collecting, organizing and storing information relating to an activity which allows us to:

- characterize important experiences resulting from the execution of activities implemented to respond to a given event or objective,

- generalize these experiences into proven work rules or procedures,

Vol. 7, No. 01; 2022

ISSN: 2456-3676

• use these experiences to facilitate decision-making for the organization and execution of future activities.

Thus, the objective of operating experience feedback is to take advantage of the past to minimize the repetition of errors and to increase the performance of an activity, a process or a company (Balmisse, 2005).

The feedback process consists of using the development of a real event as an opportunity to collect the individual experience of several actors and bring it together in the form of a collective experience. Experience feedback should make it possible to capture the representation of the dynamics of situations in order to better understand past accidents and allow sharing of the experience acquired during risk and crisis management. [Wybo, Colardelle, Poulossier, Cauchois 2001].

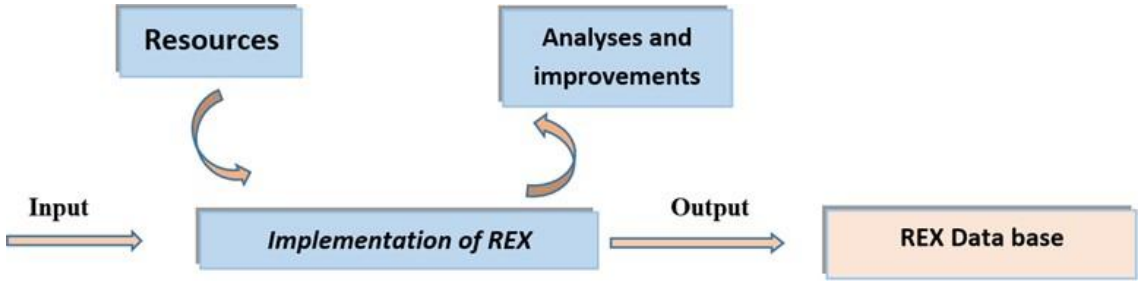

Figure 1: Mapping of the REX process according to the ISO 9000 Model feedback methodology

Feedback is an approach based on the analysis of the information collected and on the experiences capitalized (Desus, 2007). The process is composed of three main phases which are as follows:

• Capitalization: this phase consists of locating, collecting and storing information relating to the performance of an activity or a process in order to create an experience. Thus, each event processed through a process constitutes a useful and essential experience. In addition, the experiences must be modeled using a formalism understandable by the actors who will use it in support of their decision-making in consumer processes. Finally, they must be made accessible while meeting confidentiality rules.

• Processing: this phase consists of creating new knowledge or updating the old one based on the generalization of recorded experiences. This valuation is made by an expert or a group of experts who, based on what happened and which led to a success or a failure, will establish rules to reproduce the success or eradicate the failure.

• Operation: this last phase of experience feedback aims to make available and promote the use of experience and knowledge in support of decision-making for the current process or project.

Vol. 7, No. 01; 2022

ISSN: 2456-3676

Risk management

Risk is often associated with all human activity and therefore occurs at many levels of the business. The first distinction made among the types of risk concerns speculative risks and pure risks [Amrae 2000]. In the first case, the risk-taking is conscious and aims to generate a profit. For example, it involves investing capital in a new factory or launching a new product. As far as we are concerned, we are only interested in the second category. i.e. pure risks. These reflect the possibility of an event whose occurrence results in a loss for the company.

We emphasize, however, that the global consideration of risks is generally recommended in the context of construction sites.

In fact, the knowledge available on risk management is relatively well defined, Louisot (2000) defines risk management as an iterative matrix process of decision-making and the implementation of instruments which make it possible to reduce the impact of internal or external disruption events weighing on any organization.

However, according to Reason (1997), it is only after an accident or near accident that safety becomes, for a short period, more important than production in the minds of those who run the organization. All managers agree on the importance of safety over the long term, though. At this level of risk management, experience feedback can present an argument in favour of safety in relation to production. In particular, it makes it possible to assess the feedback on the experiences put in place on site, to target objectives and to allocate resources based on objective data. In order to follow the evolution of risk management in the field, experience feedback must be continuous and provide global reports based on parameters that are relevant to the decision-maker. On the other hand, decision-making at the highest level must also be influenced by more discontinuous experience feedback relating to accidents or near accidents on site.

2. Practical case study: setting up an experience feedback system in a building company

Our case study aims to show how to analyze and develop a feedback system in a building company, specifically on a construction site, by focusing on the community of practice, i.e. the site managers, the team leaders and workers.

We begin by describing how the community of practice under construction participates in the development of experience feedback and how we can play on the functioning of these actors to develop, enrich and set up a feedback system.

Therefore, we will start by first explaining the research methodology followed during this work. Then, we will show how the community of practice manifest themselves in relation to the REX. Finally, we will present an example model of the REX device.

Research methodology

The aim of our study is mainly qualitative, which is justified by the exploratory nature of this work. The fieldwork took place over a period of six months, within a company that, for reasons of confidentiality, we will call X.

Vol. 7, No. 01; 2022

ISSN: 2456-3676

Data collection was mainly based on:

1- The techniques of direct observation in the field. That is to say on a construction site, which allowed us to directly observe the experience of individuals on a daily basis.

As a result, during our on-site visit, we noted that one of the actors occupies the function of Quality, Safety and Environment manager. The difficulty of this function lies in creating a relationship of trust with the community of practice. This relationship has been built over time through daily exchanges and collaborative work. A log sheet was kept throughout the research to record all the observations collected in the field with the aim of processing them using a matrix.

2- Maintenance techniques which also involve collecting data from multiple actors on the site. Interviews were conducted to understand the level of safety within a site.

With the sites being numerous and of short duration, we decided to limit our interviews to actors working directly on sites i.e. site managers, team leaders and workers, while guaranteeing them anonymity. What these groups of people had in common was the fact that they all worked on construction sites, bearing in mind of course that they differed in their age, years of experience, the size of their site, the phase of construction and the progress of their project.

We conducted forty interviews on three different sites. The interviews took place after a brief explanatory introduction to our research topic. The interviews were guided, starting first with the site visit by putting the remark on the safety supports used on the site given by the company and finally the information that the actors received concerning safety and the way in which the information was transmitted. After the introduction we brought the discussion to Personal Protective Equipment (PPE), then to occupational accidents and finally to own safety practices.

3- third data collection technique was based on action research techniques whose objective was to validate the results of interviews and observations.

Limitations in the use of REX in a construction company

The company in which this research was carried out is an important group in the construction industry. The operational center is made up of:

-The workers, the team leader and the site manager who are in direct contact with the site.

-The work supervisor who directs the site, monitors and controls the progress and quality of construction work on the ground. He coordinates the interventions of the various trades and carries out the reception of work.

-The project manager who is responsible for supervising and carrying out studies related to the construction of the structure.

Our main goal was to find out how the REX works within the framework of this organization. Instantly, it appeared that within this company there were two very inefficient devices used

Vol. 7, No. 01; 2022

ISSN: 2456-3676

mainly in the event of the need for analysis of accidents and near misses, and that's only because the legal obligation to declare accidents of work necessarily pushes for the collection of information aimed at improving practices and safety at work. In addition, this obligation also requires a system for collecting information on near misses through the form of files. These sheets allow anyone working on a site to anonymously report to the Quality, Safety and Environment (QSE) department an accident or near-accident situation which they have witnessed or been a victim. The files are then analyzed separately and compared in order to determine if there are repetitive causes causing these situations. The results of this analysis are then presented to the Health, Safety and Working Conditions Committee so that safety measures can be adopted properly.

In practice, very few files are sent to the QSE service. In six months, we noticed that this service received three files for all the sites. It turned out during the interviews that these files were often ignored by the project managers and the site managers.

We first noticed that most of the players in practice had no idea about the REX device, its role as well as its operation, while the minority who knew it had a negative image about it. The REX was very often seen as a tool aimed at sanctioning bad behavior, which led workers to refuse to use it.

In general, we frequently observed that documents related to safety were unknown, misunderstood or not found by the people in the field even though they showed the willingness to transmit information on working conditions on the site and testified to their desire to improve safety.

Based on our study, we can attribute the lack of effectiveness of feedback within this company to two reasons:

- The first is that the hierarchical line is broken down into two levels. however, we have observed that the team leaders and the site managers were in close proximity with the workers, which would not appear if the only problem operation of Feedback came down to is a hierarchical issue.

- The second reason is due to the fact that the hierarchical structure is designed in relation to an operating logic of the company which has the role of maximizing its profit and its efficiency. That is to say, if we take into account the study of several authors (Dejours 1995; Journé 1999) we find that security is not a simple objective datum of the functioning of organizations but an individual and social construct resulting of another company. We can clearly see that the question of power relations, if it cannot be eliminated, is only one of the components of this company, which is part of a logic based on practices, and on the actors of the environment in which they work.

Vol. 7, No. 01; 2022

ISSN: 2456-3676

Identification of the community of practice on site participating in the development of the feedback

The first group of practice actors that we have identified includes site managers, team leaders and workers. These members are in the business of organizing a site. Thus; in this context they develop strategies for managing their safety which are based both on the prescriptions made to them and on a dynamic of transmission and sharing of knowledge.

The use of Personal Protective Equipment (PPE) by workers, team leaders and site front workers is a good example since even if some PPE is systematically used in the field others are ignored or even rejected by the workers.

For instance, a helmet with chinstrap, safety shoes as well as overalls were automatically given to the worker as soon as they joined. But, even if the wearing of overalls and safety shoes was respected, that of the helmet was much less, despite it being compulsory for construction sites and the workers being well aware of this obligation.

In fact, when a hierarchical superior or a Quality, Safety and Environment manager arrives on the site the information is transmitted quickly and everyone then equips themselves with their helmets for fear of sanction, not for personal safety.

During the field visits we noticed that 5% of workers wear their helmets correctly.

We also noted that visual, hearing and respiratory protection were rarely used, their usefulness was not perceived.

On the other hand, all the risks of electrification are perfectly understood by 90% of the actors. Workers systematically ask for the appropriate PPE such as gloves against electricity or goggles against electric arcs. The danger is easily visualized, and 70% of workers know at least one colleague who has been the victim of an electrical hazard, or has been themselves.

The second group of practical actors that we have identified includes the project manager and works supervisors, depending on the size of the site. In addition to the budgetary management of the site, they are also in charge of safety, drafting of the Particular Safety and Health Protection Plan (PPSPS) and collecting safety procedures for the site.

Finally, the last group identified during our analysis includes members of the General Management. In fact, General Management takes decisions relating to the company's safety policy in collaboration with the Quality-Safety-Environment (QSE) department. The head of this service reports directly to General Management. The missions of a QSE manager are of several types:

-Investigating accidents in order to use them regarding feedback. It is on the basis of the statistics, field observations, and discussion with management that a prevention program will be established.

Vol. 7, No. 01; 2022

ISSN: 2456-3676

-Check, control and adapt the protective equipment and materials accordingly and suggest improvements to site facilities and work processes and lead safety campaigns,

-Receive and train the organization's personnel in matters of security.

In general, the members of these identified groups devote part of the management committees and six-monthly committees to safety. They are the only ones who know the indicators for all of the organization's work sites (statistics on work accidents, occupational diseases, contribution rates).

The following figure summarizes the practice of the three groups identified previously with respect to a construction site.

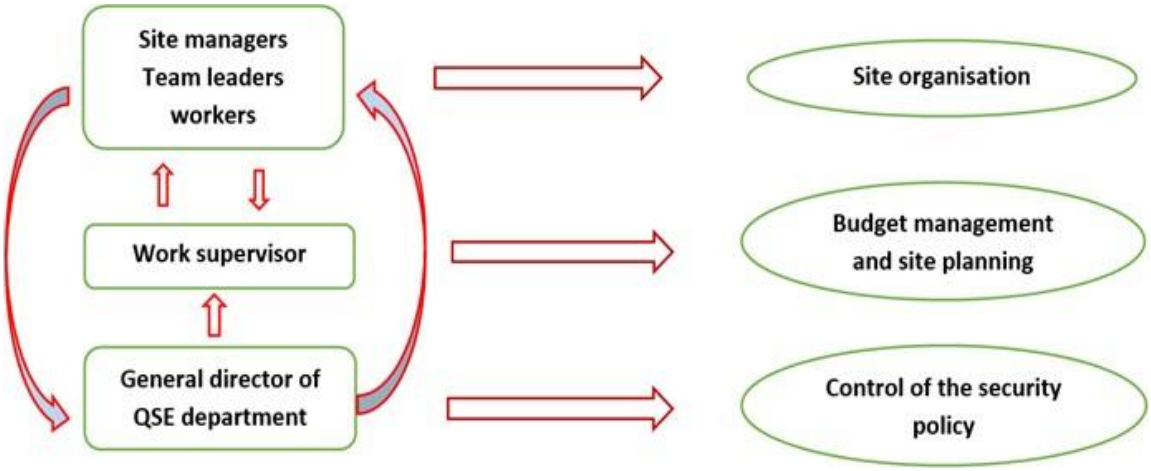

Figure 2: the practice of communities under construction

Classification of site risks and recommendations for good risk management practice

Construction often forces workers to work in a risky situation, injuries and deaths caused by these situations represent many accidents each year. The risks increase as mobility restrictions come into play.

Construction is the sector of activity most affected by serious accidents, sometimes with a high frequency rate.

Even if zero risk does not exist, changes in habits and the implementation of simple rules can significantly reduce the number of accidents on a site.

The following table shows the risks most frequently encountered on site:

Vol. 7, No. 01; 2022

ISSN: 2456-3676

Table 1: classification of site risks

Risk classification	Risk factor	Possible risks	Actions for good riskmanagement
The major risks	-Working at highaltitudes - Collapses -Falling objects -electrical shock…	Severe trauma Death Electrocuti on	Remain vigilant Wear protective gear
Minor risks	- Repetitive andexcessive noise -Excessive exposure todust -Risks related to tools -Use of chemical products ...	Hearing problems Respiratory diseases (pulmonary insufficiency,asthma, etc.) Sharp tool injury with secondary wound infection Dermatological problems Allergy…	A pair of earplugsor noise-cancelling headphones All issued PPE must beused correctly
Risky situations	-Working postures -Unorganized workplace -Poor waste manageme nt -Mismatch between resources and work -The behavior of the workers	Musculoskeletal disorders Causes serious risks in case ofrepetition	Awareness of good skeletal postures Awareness of the rightactions at work Adapt your behaviour tolimit the risks

Most accidents and near accidents originate from a poorly organized and a cluttered work site. As such, the first preventive measure involves a reflection on the practice of hygiene and safety on site, namely:

Organization and installation of the site: organization of flows, movement of operators, machinery and supplies, lighting and securing of traffic routes and storage areas as well as permanent storage of the site (pallets, cables, pipes, various materials and tools…).

Vol. 7, No. 01; 2022

ISSN: 2456-3676

Regular cleaning helps reduce dust levels. It is advisable to carry out a cleaning of the site with the appropriate tools (vacuum cleaner with absolute filter) or with cleaning liquids.

Personal protection which starts with respecting the rules of personal hygiene: do not smoke, wash your hands frequently to avoid inadvertently ingesting a toxic product and don't eat on the workplace. This is done by using a single refectory place with sink, use of chemical toilets, drinking water regularly during hot weather, etc.

The working conditions on the sites show that it is impossible to eliminate all risks by putting in place collective protection. It is therefore imperative to use personal protective equipment as appropriate:

- Construction helmet to protect against falling objects
- Safety shoes or boots
- Protective glasses especially when using grinders.
- waterproof nitrile or neoprene gloves, with an inner coating and high cuffs on the forearms to avoid prolonged wear in order to avoid the risk of maceration and sweating, for handling chemicals.
- Noise-cancelling hearing protectors when using noisy tools
- Dust masks
- Knee pads for work on the floor
-Clothes suitable for building work and climatic conditions
-High visibility signal clothing if working near a public road.
- A kit containing unexpired first aid material (antiseptic solutions, dressings, etc.) easily and quickly accessible, making it possible to immediately disinfect and heal any skin wounds or to wash the eyes in the event of dust in the eye.

In addition to these hygiene advice, it is important to put in place a real communication strategy with the personnel with a reminder of the safety conditions. So, before starting the work it is essential to have:
- An induction time (generally 1 hour) before the start of work
- Awareness-raising time of fifteen minutes each day and before each start-up
- Conduct several awareness sessions for staff after an accident, showing them the causes and risks of the latter

It is essential to bear in mind all the risks inherent in a worksite in order to be able to anticipate them, protect themselves from them and strive for zero accidents. The rules to follow are most of the time very simple: knowing and respecting the instructions and wearing PPE. The generalization of these basic rules would considerably reduce accidents on site.

Vol. 7, No. 01; 2022

ISSN: 2456-3676

3. Proposal of a method for improving the functioning of experience feedback

After having described the actors of practice that we identified within our company, it remains now to analyse how these actors can make it possible to understand the functioning of the system of experience feedback.

Indeed, the operating logic of the security system within the company includes a learning that is specific to each member of the practice, i.e. workers, team leaders and site managers who develop management strategies. of danger,

On the other hand, the front workers or business managers also endeavour to limit the apparent loss experienced on their sites, either by an adequate management of the PPSPS, or in the worst case by strategies of concealment.

Finally, the development of security policies is done at the level of general management both through contacts with other actors outside the organization and through committees that meet periodically.

The collection of experiences faces certain difficulties:

- On the one hand, a difficulty in communication between workers and the Quality, Safety and Environment manager which causes poor data collection for feedback.
- On the other hand, an additional disturbance of this relationship by the supervision, which is political nature.

An immediate response to this difficulty must be provided by encouraging or pushing front workers and project managers towards reporting instead of indirectly sanctioning them.

This device took the form of a safety case allocated to each person likely to be in a position of responsibility vis-à-vis the site, a case which includes all the documents relating to safety. The latter serves a dual role:

- On the one hand, it constitutes a border object between two communities, which makes it possible to crystallize the existence of a link between them.
- On the other hand, it makes it possible to bypass the supervisory concealment mechanisms by exposing the existence of a possibility of sharing knowledge and experience between two communities of practice.

The role played by this device led to immediate progress. The experience feedback sheets started to be transmitted with a much higher frequency than previously attested. The introduction of this device is therefore clearly results in an improvement in feedback, both by stimulating communication between communities of practice and by regulating relations between communities.

4. Conclusion

This article shows how the community of practice underway enriches and sheds light on the conditions for setting up feedback. This study is exploratory in nature and needs to be extended, systematized and generalized. At this stage, we have proven the idea of designing REX systems

Vol. 7, No. 01; 2022

ISSN: 2456-3676

by relying on the practices of the different communities that it will affect and by taking into account the migration of knowledge in the organization.

Our research also enabled us to validate the success of the safety case by mentioning the importance of the actors in the circulation of knowledge in the organization which participates in the development of the safety case starting from the feedback.

However, these can only be effective on condition that they are part of the participation of all the actors of the practices. In turn, this imposes a real incentive for these actors to act in this way.

We can retain among the perspectives that emerge at the end of this work:

Empirically, it might be interesting to consider transferring this approach to other sectors, in order to draw more general lessons. It would also be desirable to focus on the impact of learning in each of the communities that our work has been able to promote.

Acknowledgments

We would like to express our very great appreciation to all team members for their valuable and constructive suggestions during the planning and development of this research work. their willingness to give their time so generously has been very much appreciated

References

Allouche and Amrae, “The managing shareholder of the family business” Revue Française de Gestion 2002, n ° 141, pp. 59-105.

Dejours, The Human Factor 2000, Paris

Wybo, Colardelle et all “Risk management in software projects and processes”. Doctoral thesis, University of Bordeaux.

Gauthey, “Feedback: State of practices in an industrial environment”, Notebooks of the Institute for a Culture of Industrial Safety, n ° 2005-1, Toulouse.

Giordano "Building a Research Project: A Qualitative Perspective”, Paris: Management and Society Editions 2003.