Towards an organization certified in emergency plans management

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ABSTRACT

QuEP is a framework that guides organizations in assessing and improving their emergency plan management by following a set of principles, practices, and techniques at the different maturity levels established in the *QuEP* model. Its main objective is to be applied to real cases to discover the state of an organization's emergency plan management and recommend techniques for improvement. In this paper, we describe the first application of *QuEP* as a prior step to its implementation and possible use in official certifications for emergency plans with a guarantee of quality. So, we have applied a real case in a UPV building towards the certification of the emergency plan management.

Keywords

Emergency Plans Management, Total Quality Management, Maturity Levels, Techniques, Certification

INTRODUCTION

Organizations' efforts to instill continuous improvement is related to the ability to deliver products and services to customers with a quality mark. Organizations in different areas need to guarantee their products and services according to international quality standards. Certification gets a formal document to certifies that a product, system or person complies with guidelines established in a given standard, which has a period of validity. A certification must be objective, reliable and accepted by all interested parties.

The quality assurance approach is reinforced by a third-party certification system, where an independent, specialized and duly accredited organization certifies through an audit based on predefined quality standards; or homologate a product proving that it meets the technical. The confidence of certification by third-party is superior to the first-part certification or internal evaluation, or the second-part certification or carried out by another organization since the certifying is impartial (Camisón et al. 2007). The value of this certificate rests on the prestige or quality mark. Among the standard commonly accepted in the international scope like ISO. In fact, ISO9000 certification and Total Quality Management (TQM) practices directly affect organizational performance.

The ISO 9000 family contains some of the best-known ISO standards, which cover different aspects of quality management (D. Singhal and K. Singhal 2008). For example, ISO/IEC90003, which deals with software engineering, ISO31000 with risk management principles and guidelines, ISO14001 with similar environmental management systems-requirements, with guidance for the use of, among others (ISO 2016). Furthermore, the ISO 22320, is an international standard for Emergency Management Systems and Incident Response that allows organizations to develop and improve their response capabilities (ISO 2011).

On the other hand, as TQM implementation focuses on the criteria for a quality award, it allows some organizations to use this approach which can result in improvement based on relevant TQM models. For example, the Deming Prize (JUSE 2014), the European Quality Award (EFQM 2014), or the Malcolm Baldrige National Quality Award (Baldrige 2014), among others. A certification or Seal of Excellence shows that an organization is profitable while guaranteeing a high level of quality products or services. However, there is no certification for organizations with proper emergency plans management.

QuEP has been presented as a framework inspired by TQM to assess and improve emergency plan management in organizations (Núñez et al. 2016b). Currently, *QuEP* has a model supported by a web application, which is the *QuEP-Tool v1.0*. Applying *QuEP* to real cases is vital to determine the current state of an organization regarding its emergency plan management and what techniques it should consider for continuous improvement in its activities. Consequently, the goal is to gain skills in all the activities performed by the stakeholders before, during and after the emergency plan management. This paper describes a work in progress of how *QuEP* can be used to certify emergency plans and their subsequent maintenance as a certification by third-party.

This paper is organized as follows: Section 2 describes the emergency plan life cycle and how *QuEP* is integrated to support the certification subprocess. Section 3 describes a case study in which we assessed an organization as a pilot test for certification. Section 4 concludes the paper and outlines further work.

THE EMERGENCY PLAN LIFE CYCLE

The emergency plan follows a series of steps from the preparation, implementation and continuous maintenance, as indicated by regulations or laws such as: the "Self-protection Law" (NBA 2007) in Spain, the "Comprehensive Preparedness Guide" (CPG) 101, published by the Federal Emergency Management Agency (FEMA) (CPG101 2010) in USA, the United Kingdom's "Guidance-Emergency preparedness" (UK-gov 2013), among others.

The general process that we inferred from the regulations is shown in Figure 1, where the first step in preparing the emergency plan focuses on how the organization must follow the regulations. The second step is related to the implementation of the emergency plan, in which the organization must train staff, establish public information mechanisms, and provide resources for the application of the emergency plan. The next step is related to the certification that would allow organizations to prepare and implement better emergency plans. The last step is the maintenance and continuous improvement of the emergency plan that involves activities such as: following a continuous successive and interactive preparation process, conducting training activities, conducting emergency drills, and evaluating the emergency plan, taking into account that the emergency plan evaluation should cover a maximum period of three years.

The certifying process requires to ensure compliance with the norm through steps such as if the organization complies with the requirements defined according to local regulations, through an assessment model or approval accrediting that the organization follows certain technical specifications carried out in the different activities of the emergency plan management. Although the public administration approves regulations and laws, receives and approve the emergency plans proposed by organizations, there is a lack in the life cycle of these activities in the preparation, implantation, and maintenance of the emergency plan, which is related to the fact that there is no certification that provides adequate support for this. The weak point in this work is that in many cases organizations register their emergency plans based on current laws, but much more remains to be done, and the public administration does not provide an adequate follow-up to each step. *QuEP* supports certain activities of the emergency plan life cycle, as shown in Figure 1 by the dashed red line.

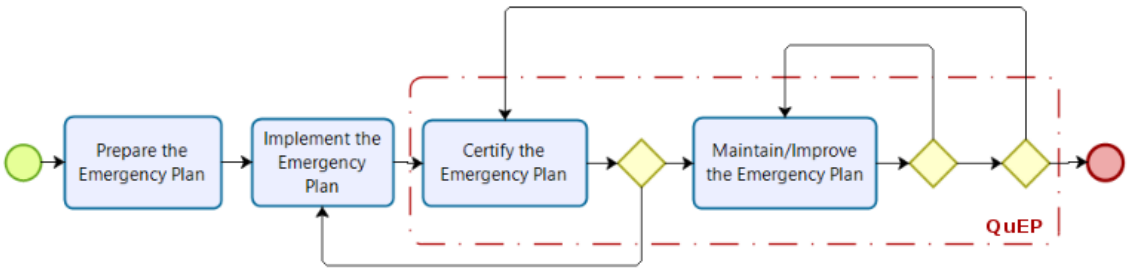

Figure 1. The Emergency Plan Life Cycle

The QuEP framework

QuEP (Quality of Emergency Plans Management) is a framework for the assessment and improvement of emergency plan management within organizations (Núñez et al. 2015). The *QuEP* framework is based on the study of quality aspects of a good emergency plan (Berke and Godschalk 2009). *QuEP* assesses the planning process and analyzes the capabilities of the participants, and all the activities carried out before, during and after the process of implementing the emergency plan. Firstly, the *QuEP* core is defined by maturity levels, which can be seen both as evaluation criteria and as a roadmap for the improvement of the different activities or practices carried out

(shown in Figure 2(a)). The *QuEP* model is then defined (shown in Figure 2(b) with a UML class diagram); this is the basis of our assessment model that is based on principles, practices and techniques (Dean and Bowen 1994). Dimensions are established that define the activities or practices that will be discussed in each of the principles and their corresponding maturity level, and finally, questionnaires formed by questions that are provided to the corresponding stakeholders by role (shown in Figure 2(b)).

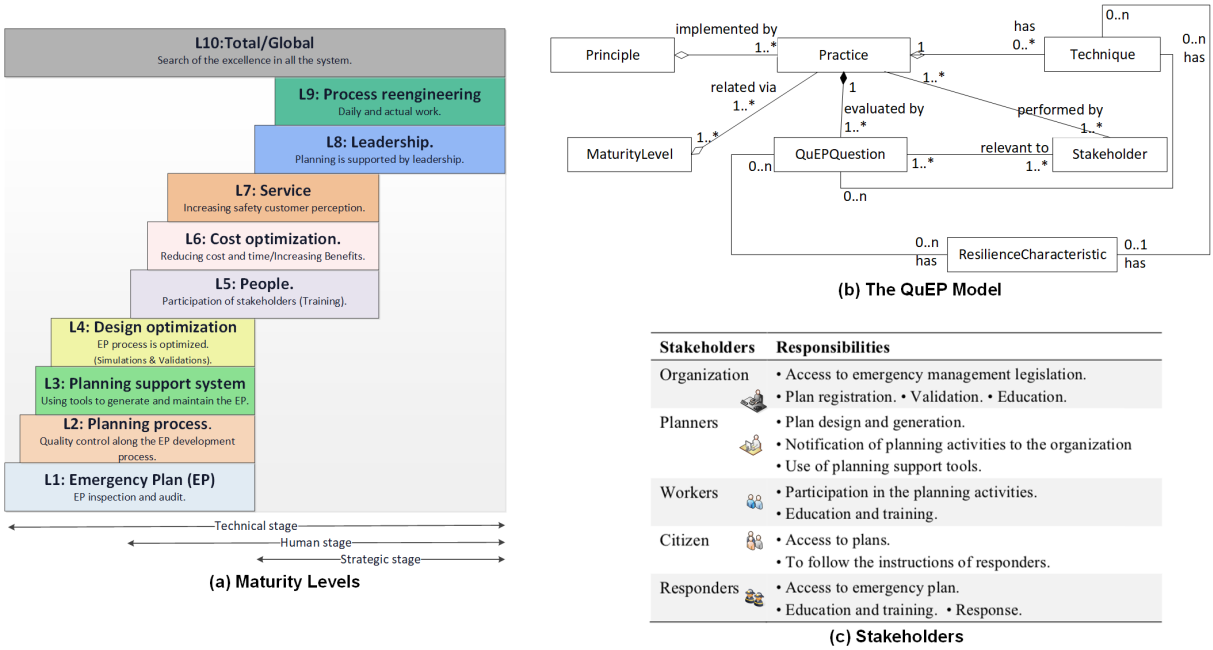

Figure 2. Maturity Levels and QuEP Model extracted from Núñez et al. 2016

Ten levels of maturity are defined in *QuEP*, from level 1 (L1: Emergency Plan) to level 10 (L10: GCT (Global/Total)). These levels are grouped into three stages: the technical stage, the human stage, and the strategic stage, following the approach proposed in Camison (Camisón 1998). Each of the levels associated with each stage is seen as the steps of a ladder that every organization committed to the search for quality improvement in the management of its emergency plan should try to climb.

QuEP principles are intended to guide the organization in the management of quality regarding emergency plans and planning processes, including the actions of all its stakeholders involved in emergency plan management activities (shown in Figure 2(c)). In *QuEP*, nine principles have been identified, including *Risk-Driven (A)*, *Implementation (B)*, *Participation (C)*, *Monitoring (D)*, *Cooperation (E)*, *Safety People (F)*, *Leadership and Policies (G)*, *Results of objectives (H)*, and *IT & Innovation (I)*. The practices are activities that facilitate the application of the principles of the QuEP framework and lead to the organization complying with them in the emergency plan management. The principles are implemented through practices that are carried out by all stakeholders in the organization. In *QuEP*, twenty-seven practices have been identified grouped by principle. For instance, practices such as *emergency drills*, *resource improvement and maintenance*, *process improvement*, and *process for updated emergency plan* concern to *Monitoring (D)* principle. The techniques provide the organization with the knowledge of what should be done to apply the best practices in the emergency plan management. A set of guidelines and recommendations associated with each of the practices was identified to identify the techniques, obtained from different guidelines, regulations or laws available in some countries. The resilience characteristics can be associated with questions and techniques as complementary practices and the coordination of multiple stakeholders working towards more resilient organizations.

Assessment of the *QuEP* framework by experts in planning and risk management is essential to validate its viability for evaluating emergency plan management (Núñez et al. 2016b). The results obtained from the *QuEP* questionnaires given to the stakeholders of an organization facilitate and automate the assessment of an organization and generate the appropriate improvement reports to identify the best practices through the support tool *QuEP-tool* (Núñez et al. 2016a). Results are presented to know the minimum requirements of an emergency plan management at each maturity level as acceptable or tolerable. Currently, the limit or threshold value μ=0,5 have defined from beforehand. Also, QuEP considers if a question has more weight than others. It means, there are questions more relevant.

Before certifying the emergency plan management first step is to perform tests in real organizations. A pilot assessment is essential to ensure that the *QuEP* model is adequate, viable and competitive in organizations under public administration regulations.

CERTIFICATION PROCESS

Our proposal for certification in organizations with *QuEP* follows a process, where the first step is the *preparation* that includes the selection of the organization and the stakeholders involved. Next step is related to the *QuEP application* in the assessed organization. The last step is the *reports presentation* to the organization related to its management of the emergency plan and the aspects that must be considered to achieve continuous improvement in its current and future activities.

Preparation

For the pilot assessment, we have selected as organization the 1F-UPV building at the UPV, and 25 *stakeholders* have participated based on roles defined in *QuEP*. In this context, we contacted the person responsible person for the emergency plan in building 1F, who participated in the organization role (Org.). A person responsible for planning and accident prevention in the UPV played the planner role (Pla.). Fifteen other people were selected for worker roles (Wrk.), of which seven were Master students, two professors, and six Ph.D. candidates in Computer Science. Eight people who had accessed the 1F building at least once participated in citizen roles (Cit.). The assessment of the responder role (Rsp.) was omitted, since no emergency drills had been held in the 1F-UPV building since 2011.

QuEP application

We have developed *QuEP-Tool v1.0* to carry out the application of *QuEP* in the 1F-UPV building. This tool support to apply *QuEP* and later get the results. In order to assess an organization *QuEP* uses questionnaires[1] according to principles and their associated practices, and a set of questions defined to assess the degree of compliance with each *QuEP* practice. Different techniques have defined to help the organization improve its practices and, as a consequence, to increase their maturity level.

To the 1F-UPV building assessment, only two of the nine principles have been assessed: the *Risk-Driven (A)* principle and the *Monitoring (D)* principle. The first step was to make visible the information and guides about the 1F-UPV building assessment through *QuEP* portal[2] protected by a password. The stakeholders who participated in this assessment were given a user password via email. The next step was to make the assessment, between April 23 and June 1, 2018. The research team then analyzed the results.

Reports presentation

The maturity levels obtained for the 1F-UPV building are shown in Figure 3. The organization reached a global maturity percentage of 54.8%, which we consider as tolerable although capable of improvement. For the certification of the emergency plan management, the tolerance should be considered at each level, defined in advance through a limit or threshold value. If we assume that it is 50%, this organization would be certified, but with a list of improvements to be made. The advantage of QuEP is that it also breaks down the results into levels, which allows a much more detailed analysis.

100% results were obtained at levels 3 and 6, since the answers to the questions for the organization holder and planner roles obtained the highest value. At level 7 most *stakeholders* responded that they did not know if the organization announced the programming of the emergency drills or if an analysis and report had been carried out after an emergency drill. Something similar happened at level 9, the vast majority were not aware of whether for example, the organization prepared periodic reports of emergencies (emergency drills, and incidents, among others) or if security inspections had to be registered.

Analysis by groups

The results divided into four groups for analysis. The first group (GRP-1, 17 *stakeholders*), consists of the results obtained from the planner (Pla.), organization holder (Org.) and workers (Wrk.), without considering the citizens (Cit.). The second group (GRP-2, 5 *stakeholders*) was made up of the results of the planner (Pla.), organization holder (Org.) and the workers (Wrk.) with experience in emergency plan management (two professors and one

[1] https://quep.webs.upv.es/quep-questionnaires/
[2] 1F-UPV building: https://quep.webs.upv.es/es/evaluacion- del- edificio- 1f/

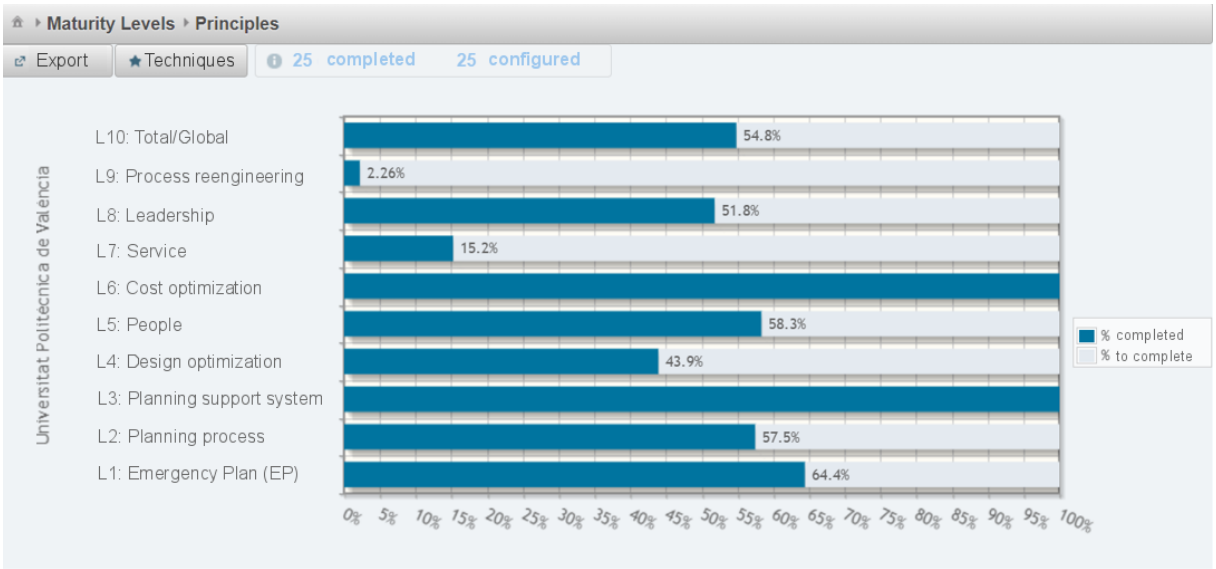

Figure 3. Results of the 1F-UPV building by *maturity levels*

Ph.D. student). The third group (GRP-3, 2 *stakeholders*) consisted of the results of the planner (Pla.) and the organization (Org.). The fourth group (GRP-4, 1 *stakeholders*) consisted only of the results of the planner (Pla.).

The results by stakeholder groups are shown in Table 1. The maturity percentage obtained at level 10 was 54.8% and in GRP-1 was 54.7%, which dropped by 1% because some citizens had more training in academic institutions than some Ph.D. students, who lacked information. In the following groups, we can see that the percentage increases as the groups are made up of participants who are aware of the management of emergency plans. In fact, the planner has the most information of the whole process of drawing up, implementing and maintenance of the emergency plan.

Table 1. Results by group

	All (25)	*GRP-1 (17)*	*GRP-2 (5)*	*GRP-3 (2)*	*GRP-4 (1)*
Global/Total (Level 10)	54.8%	54.7%	61.8%	66.8%	74.6%
Risk Driven Principle (A)	72%	71.1%	76.6%	77%	87.2%
Monitoring Principle (D)	43.2%	44%	49.5%	50.6%	67.3%

Although the score obtained from the planner results (GRP-4) is 74.6% excellent, we were interested in the planning process to disseminate the necessary information at all levels, so that the different *stakeholders* could have access to information and be trained in accident prevention. The results obtained by principles show that risk management is much better than monitoring in all the groups. The percentages obtained in the evaluation of the 1F-UPV building with the *stakeholders*' GRP3 and GRP4 responses were higher than those of the responses of all the *stakeholders*, since the planner and the organization holder have more knowledge than the workers and citizens.

Recommended techniques

Figure 4 shows an example of techniques or best practices that should be considered in the 1F-UPV building to increase the quality of the planner assessment in the emergency plan management (GRP-4), grouped by maturity levels. Only eight techniques are shown spread over three maturity levels, but the techniques increase as the stakeholder assessment is included.

Other aspects and recommendations

The results obtained in the 1F-UPV building gave us an overall view of its emergency plan management and the best practices that could be improved. In general, while 50% of the emergency plan management in this building is tolerable or acceptable, 45.2% of the activities need to be improved. This shows that the *QuEP* certification framework is viable, and can help organizations to improve their emergency plan management by looking at what can be improved and updated.

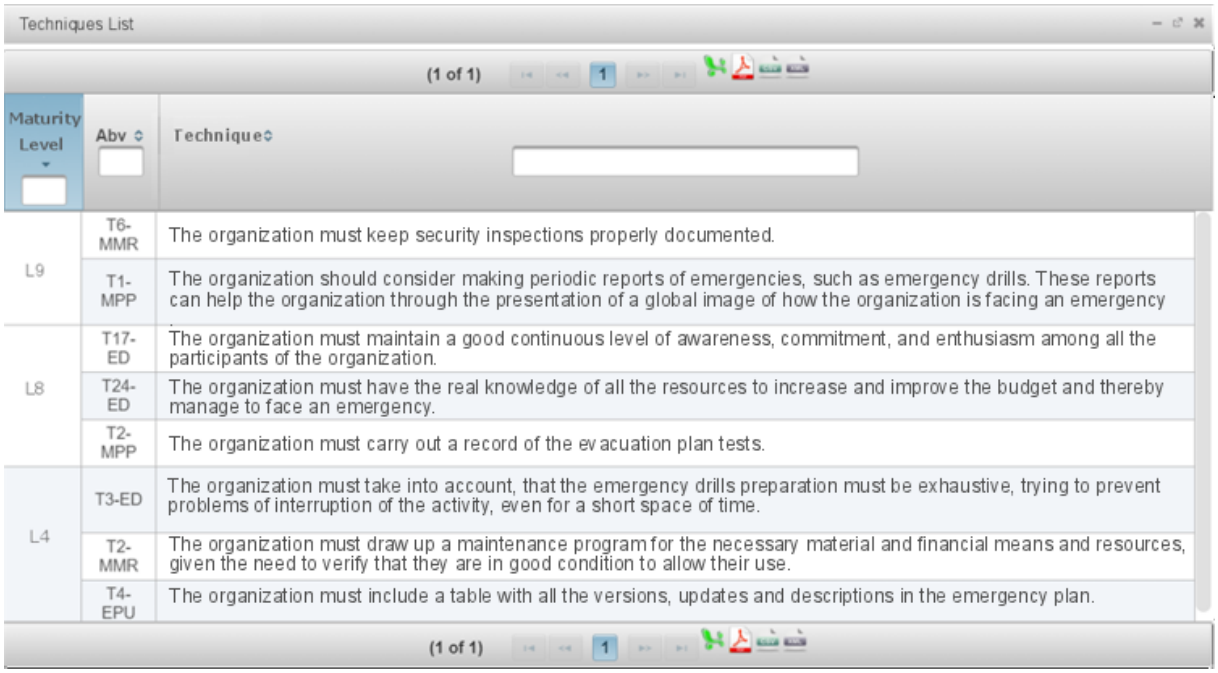

Figure 4. Recommended techniques after the evaluation of the 1F-UPV building (GRP4)

The assessment of the 1F-UPV building also showed that the emergency plan must be accessible to all the workers and not just to a group. For instance, the professors and Ph.D. students had better knowledge of the emergency plan because they are involved in research related to this domain. The Master students were aware of the emergency plan but did not have access to it. The citizens obtained better results than the Ph.D. students because the group of high school students selected had received training through annual simulations carried out at their school.

On the other hand, the emergency drills had not been carried out in the 1F building since 2011, after which the results were analyzed and conclusions were drawn, but no other action was taken. Most of the workers did not have a clear idea of the activities related to emergency drills. Further, after the 1F-UPV building assessment we considered it essential to obtain consistent results in the weights assigned to the *QuEP* questions on the expert evaluation (Núñez et al. 2016b) to give a degree of relevance to the different *QuEP* questions.

Consequently, adequate emergency plan management can increase the quality of all the activities involved, and organizations must focus on improving all the stages involved in the process.

CONCLUSIONS

The official certification of organizations about the emergency plan management is a work in progress. It can be viable as long as experts validated *QuEP* and assessed in real cases. For this instance, we have introduced the first proposal towards the certified through *QuEP*, and we have presented a study case in the 1F-UPV building. Next step is related to test the assessment by *QuEP* in more organizations and elaborate the final reports to each organization. As future work, we plan to contact public administration to propose the certification of organizations in assessing the emergency plan management.

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