



An Online Platform for ‘Black Swan’ Event Management in the Hospitality Industry

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Abstract. Black swan Events or Low Probability High Impact Events (LoPHIEs), like wildfires, earthquakes and volcanic eruptions have significant and multifaceted implications in every economic sector of the area affected; among them, the hospitality and travel industry may be at the frontier of those affected in terms of span and impact. This paper outlines a vivid demonstration of the complexity of involved business processes and their interconnections through a case study. Appropriate preparations for hospitality and travel SMEs to such events have been identified and implemented through a purpose specific information system. To design this online platform, we followed a requirements analysis methodology. The main elements from the implementation of this platform have also been included, whereas elements of an initial usability evaluation have also been presented.

Keywords: Crisis management · Black swan events · Hospitality · Tourism

1 Introduction and Research Background

Black swan events, or low probability, high impact events (LoPHIEs), which include crises, disasters or emergencies, have significant implications upon the operation of involved and affected organizations (Hergert 2004); the hospitality and tourism industry is directly affected by LoPHIEs. Wildfires, earthquakes and volcanic eruptions demonstrate the complexity of interconnections between organizations involved in or affected by LoPHIEs. Appropriate preparations to such events may make the difference between a major disruption of operations in the affected organizations or their resilience and survival (Coombs and Holladay 2010; Halder 2015). Organizations’ preparedness to LoPHIEs is usually distinguished by three phases, namely methods that prepare the organization BEFORE the event, methods that are initiated DURING the event to limit damage and methods that examine the aftermath (Bernstein 2011; Coombs 2007; Coombs and Holladay 2010).

Such approaches exhibit some fundamental limitations (Diakou and Kokkinaki 2013). The most common limitation in these approaches is the biases raised in judgment or decision-making that usually have a huge impact in the quantification of probability, uncertainty and risk (e.g., Armstrong 2006; Berg et al. 2009; Fildes et al. 2009; Goodwin and Wright 2010; Jakoubi and Tjoa 2007; Onkal and Gonul 2007; Pennock et al. 2001). This proved to be especially important when an event occurs and has an impact on a specific business sector, for example the travel industry. Consequently, we need to understand the procedures and needs of this sector and how they currently respond to possible crises, like the eruption of Eyjafjallajökull in Iceland.

The paper is structured as follows: Sect. 2 will describe the requirements analysis methodology for designing the online platform for black swan events management, Sect. 3 will give information and description of the online platform and Sect. 3.1 will provide an initial usability evaluation of the platform. Section 4 will conclude this paper.

2 Methodological Procedure for Requirements Analysis

The purpose of this study was to understand how a company in the hospitality and tourism industry handles the effects of LoPHIEs and through this to identify the requirements for a web information system that can be used in such situations by small businesses in the tourism industry and specifically by tourist accommodations.

We followed a qualitative approach that involved semi-structured interviews with different people working in a market-leader travel company to understand what they know about black swan events, and what measures the company took when they had to deal with such an event in the past.

This empirical research was performed at a company in Europe, specializing in tourist lodging and accommodation services. One of the basic services of the company is its customer service and support, available in over 40 languages, along with support for the hotel/accommodation owners who are using the platform on a daily basis for updating accommodation availability. The company has shown rapid growth in recent years in response to serving travellers and accommodation providers, and has continuously optimized its online platform to better serve the users.

The choice of this company was based on its worldwide impact and its active presence during one of the most prominent black swan events. It also combines experienced staff in both technology and administration. All the above, combined with the easy access we had to this company led us to choose it as an environment of our research.

2.1 Instruments and Procedures

To select the sample of employees from the aforementioned, who would be involved in the survey, a sampling frame was created based on specific criteria. These predetermined criteria are intended to give us as accurate results as possible.

More specifically, the introduction of the above criteria includes:

Employment Time: This criteria depends on how long they have been working for the company and if they have faced different events that they could consider as black swan events. They can report/outline these events and analyze what they themselves perceive as more important.

Field of Specialization: An employees specialization is of great importance for how s/he perceives, events and what information s/he can provide about black swan events.

Department: We get information from the department to which the employee belongs about the collective reaction of the department to that event, as well as the changes that the department has applied to address black swan phenomena in the future.

The sample of the research was targeted and carefully selected to provide answers to the questions of this research. This approach helped to collect information about what is considered a black swan event in different parts of the company and to triangulate the collected data within the company’s various departments. According to the criteria established, the sample of the survey is presented in the Table 1 below.

Table 1. Interviews undertaken with employees

Code no.	Position/Department	Position/Department during the event	Employment time
E1	Senior Coordinator/Marketing	Global Support Coordinator/Hotels Department	6
E2	Global PR Coordinator/Personal Relationships	Content Editor/Content Department	5
E3	Team Leader Long Tail Support/Strategic Partnerships	Project manager/Customer Support	11
E4	Account Manager XML/IT	Senior Customer Care/Customer Support	10
E5	Senior Team Leader/IT	Back-end Developer/IT	10
E6	Product Owner/Marketing	Technical Coordinator/Strategic Partnerships	8

After we selected the sample for this research, we followed a mandatory procedure to comply with the ethical considerations of the research and the company’s protocols. We first informed the human resource department that gave permission to the primary investigator to perform the study within the company and to use the specific sample. Then, the selected employees were contacted via email to invite them to take part in the study, provided them with details about the purpose of the study, the procedures that would be followed, and the duration of the interviews, and asked their permission to use a recording device during the interview. Most of the participants agreed to the interview recordings, and, for those who did not agree, we have only used written notes taken at the time of the interview.

2.2 Case Selection - Eyjafjallajökull Volcano Eruption

This section aims to present the findings of the primary data collection phase conducted at a well-known accommodation provider regarding black swan events. More specifically, the section provides a description and analysis of the data collected through interviews with the company's employees regarding their perception of which events are considered black swan events, who were called to deal with these events upon their occurrence, how the corporation reacted to them and finally how its organizational structures could be affected.

The sample of this study was selected in such a way as to effectively achieve disparity across different departments within the company and responsibilities of the employees. The objective was to collect as much information as possible about what is considered as a black swan event, from different sections of the company. Initially we needed to investigate the familiarity of the participants and employees in the company with black swan events and their experiences with such events.

Through the analysis of the data gathered, it can be concluded that only one employee in the company was familiar with the term black swan when describing an event. In the course of the interviews, however, it turned out that, while there have been several events experienced by the employees that meet the characteristics of black swan events, the term is not used within the company to describe them. During the interviews, most of the respondents reported different events that occurred during the time of their employment in the company and that had the characteristics of a black swan. After free and open communication between the researcher and the respondents, the eruption of the Icelandic volcano, *Eyjafjallajökull*, which took place in March 2010, was considered a representative example of a black swan event that most of the employees were familiar with, and consequently, it was selected for further analysis.

The eruption of the Eyjafjallajökull volcano led to the gradual closure of Europe's airspace for six days in order to avoid airplane crashes. European cities were, therefore, left with closed airports and all passengers traveling to destinations outside Europe, with intermediate stops at European airports, were also affected. Based on statistics, it is estimated that the event affected 105,000 flights in total and 7 million passengers in many different countries for almost one month (21 March to 24 April). In addition, the economic impact of the volcanic eruption was extremely high: airspace closure, loss in tourism revenue and decline in productivity ended up costing \$5 billion. Based on estimations, the explosion caused damages to insured property amounting to \$98 million, ranking it as the sixth most devastating explosion.

2.2.1 Implications of the Event

As expected, such an event affected the industry stakeholders (customers and hospitality providers), as well as intermediators between hotel tenants and hoteliers. According to respondents, the crisis that the company had to deal with is summarized in the following points:

- A large number of accommodation cancellations were made by passengers who could not reach their destination.
- Passengers had to extend their accommodation stay due to the closure of airports.
- Company employees could not return to their base.

As a result of the above points, the number of requests for amendments and cancellations of reservations increased dramatically. Initially, the Customer Service Department was the division directly affected by the situation, due to the insufficient number of employees to manage effectively the significant increase in the call volume and online requests.

2.2.2 Addressing the Event

Based on the Eyjafjallajökull volcano eruption, the following sub-sections describe a series of actions for addressing the event, as emerged through interviews with company employees and aim to form the foundations of a consolidated action plan for dealing with Black swan events within the tourism industry.

2.2.3 Impact Group

In this chaotic situation, action was required to stabilize it and resolve problems of inefficiency. As respondents reported, one of the first steps taken was to set up an impact group for coordinating actions and regulating the situation both internally and externally. This group was attended by individuals from each department. From an organizational point of view, the impact group consisted of people who either had managerial posts, acted as project managers, or were team leaders or technicians.

The way the impact team worked was critical for decision-making. Group meetings were scheduled every two hours (approximately) during the day. Initially, each unit that was represented in the impact group provided information on the evolution of the events, the problems they were facing and what they had successfully resolved. Then, there was an open discussion and effort to solve problems using brainstorming.

It is noteworthy that the company maintained a powerful IT department that could provide solutions to address this crisis by building new components in the IT systems. That is why the use of computer technology in the impact group meetings was critical for several reasons. Indicatively, they could respond at the same time to what configurations were feasible and let others know how much time would be required for implementing those configurations, as well as suggest a different approach if they felt it necessary.

Subsequently, the participants in the impact group communicated the decisions taken to the other employees of the departments by calling brief meetings and sending emails. The procedure described above was repeated until a relative stability occurred.

2.2.4 First Line of Communication

The impact group established an emergency communication line; representatives handling calls through this line could make decisions to address minor issues. The representatives would forward complicated issues to another dedicated communication line. All personnel were updated and were asked if they wanted to join the emergency communication line. The second line of communication was handled by employees in the Customer Service department.

Until the instantiation of this specific LoPHIE, only customer service employees were trained on the procedures to follow in emergency situations. In order to gain competencies addressing customers' requests effectively, one had to attend a thorough training session which lasted a month. Due to time constraints, the Personnel Training

Department had to reconsider and parameterize the educational material focusing only on typical procedures and create short intensive training seminars for employees serving the front-end emergency line of communication.

For optimal implementation of the emergency line initiative, in-house chat rooms were created where employees could ask more experienced personnel for clarifications about the case they were handling. This enabled the speedy exchange of formal and tacit knowledge between novice and experienced customer representatives. In addition, call tracking systems were further developed in the company's call centre which record the volume of calls received by each group. This made it easier to locate overloaded support lines, and call forwarding could be then activated. During this crisis, all employees involved in resolving and restoring stability had to work overtime.

2.2.5 Extending Customer Service

Despite the immediate mobilization of the company to help the Customer Service department, the volume of requests was too high and additional measures were needed to cope with the emergency. The company carried out a mass recruitment for the Customer Service department. Within one day, 100 people were hired on a monthly contract and started to work the next day. To enable the newly recruited employees to handle their duties so quickly, the Personnel Training Department created a second round of high-speed training seminars. One of the objectives of these training seminars was also to ensure the new employees understood the philosophy of the company before taking part in the crisis management.

2.2.6 Negotiations with Hotels

A special weight in the management of this crisis was the negotiations that took place with the hotels regarding cancellations of reservations made through the company's website without any cancellation costs. Excellent cooperation between hotels and the company was reported, and there was no intention for any party to exploit the situation. In most cases, cancellations were made free of charge and, where this was not possible, hoteliers offered the tenants the option of rescheduling their booking for another time in the same or another hotel of the same standards with which they were collaborating.

2.2.7 Contacting Hotel Tenants

According to the respondents, the company was not active in social media network at the time of the event, which made it difficult to connect and communicate instructions to hotel occupants who had not yet contacted the Customer Services department. In cooperation with the IT department, an extra space was created on the homepage of the website, where instructions were posted to hotel tenants regarding what they should do if their reservations were affected by the volcano eruption.

Essentially, it was defined and advised that the arrival of the tenants was considered 'urgent' if it was within the next 45 h, where priority was given to settling the cancellation or extending their stay. In this way, an initial routing of the communication was established, and additional calls could be avoided.

2.3 Organizational Structures of the Company After the Event

Responses determining the recovery time were found to be indistinguishable, and differed depending on the respondents' department and position held. The departments that took longer to return to normal work were the Customer Service and the Hotel Support departments, as these were the departments most affected by the crisis. The recovery period was reported to range from 2 to 5 weeks.

According to the same respondents, the additional components of the information systems created only to support this event had to be re-implemented to be included as core functions in the systems, which was quite time-consuming.

The results are presented in more detail in the Table 2 below.

Table 2. Recovery timeout

Department	Reset time (weeks)
Marketing	2
Customer service	4-5
Hotel support	4
Content	2

The participants in the study pointed out that this was an extreme, unpredictable event and that the company was not ready to deal with it. Nonetheless, it is encouraging that the company was organized; the departments involved worked in coordination and reacted quickly to the situation, thus achieving to provide support to both tenants and hotel owners.

When the situation was stabilized, meetings were held in order to evaluate the way the company reacted and what could be done differently if such a situation happened again in the future. A common conclusion from these meetings was the need to establish emergency procedures. In addition, one further conclusion was that the information systems used within the company should be scalable and more flexible.

Part of the procedures established after the eruption of the volcano were concerned with the other departments creating the first communication lines to provide support to the Customer Service department in cases of unusually increased number of calls (i.e., high season demand in the summer months). In achieving this, the way in which staff training is carried out has been restructured. Furthermore, the IT department had to set up the appropriate infrastructure to enable calls and call centre support requests to be routed to the rest of the departments.

The Eyjafjallajökull crisis helped the company redefine how customer service is managed. Over the next years, more emphasis has been put on enhancing the company's customer-centric philosophy. Customer Service department has been restructured; new roles have been identified to improve communication and new processes have been implemented to enable settlement of similar events more effectively in the future.

3 Online Platform for Black Swan Event Management

Based on the insights outlined in the previous section, it appears that certain functional specifications are considered important for the organization to be able to handle a black swan event. This is linked to both the immediate reaction of employees as well as the direct parameterization of information systems that are used to make it easier to deal with the situation right away. Our goal is to develop an online management application that small-sized hotel units can use, which, apart from the basic functionality, will be enriched with additional black swan events management mechanisms.

For the purpose of demonstrating the proposed Event Management Services for black swan events, basic hotel management mechanisms were also implemented. Through the online application, owners or administrators will be able to manage the reservations and the hotel's availability, as well as to access the guests' details so as to have further communication with them. The additional black swan events management mechanisms enable managers of the hotel unit to follow simple procedures that can face a potential crisis, without the need for additional technical support. Since any additional technical support for information systems in small businesses is not covered by their own employees, but instead by external partners, this online application aims to address issues with minimal response time to any LoPHIE.

The application consists of the following:

Back-end, which contains the management part of the application, e.g., room availability, and the management of additional procedures related to Black swan events.

Front-end, which consists of the public space of the application that can be used by customers for booking a room and getting additional information on the hotel and the surrounding area.

3.1 Back-End Implementation Based on Requirements

For the development of an online platform that could be employed to address LoPHIs, we used the Drupal CMS. In this paper we will focus only on the design and implementation of the back-end features that also contain the tools for black swan events management.

3.1.1 Hiding the Room Search Mechanism

To implement the mechanism that will hide the search engine from the public site during emergencies, the Emergency module is used. This module allows the website's public space to be adapted during a crisis (Fig. 1). It gives the flexibility of creating multiple emergency levels according to the situation. For this application, we created two levels (Medium and Low), which are both related to the search for availability.

3.1.2 Implementation of Alert Messages

The site Alert (Fig. 1) module has been used for implementing alert messages that would appear in case of an emergency. This module allows for setting the timeframe for the alert messages to appear and disappear after the time frame ends (Fig. 2).

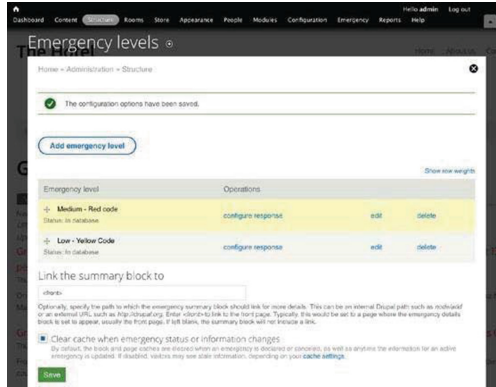


Fig. 1. Emergency module for hiding room search

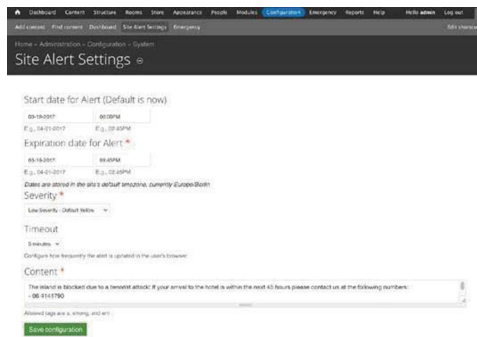


Fig. 2. Alert messages

3.1.3 Update Messages from Relevant Parties

Updates from stakeholders are made using the Drupal open-source content management software (Wunderground weather module and Feed Aggregator see Fig. 1), which are projected at the management panel through block structures. The manager of the hotel unit can customize the sources’ updates by creating and adding new feeds (Fig. 3).

3.1.4 Mass Customer Message Updates

Using this functionality, the unit manager can inform a group of customers about a specific situation that affects their bookings. In this way, we ensure that all interested customers will be informed even if they do not enter the website. Similarly, the manager does not have to inform each interested customer, one by one.

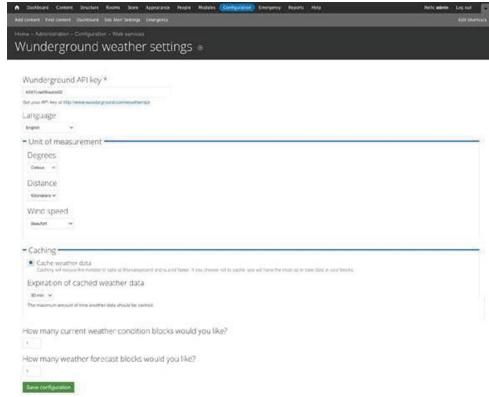


Fig. 3. Update messages

3.2 Front-End Design of the Online Application

The basic function of the public section of the application is to demonstrate how users can, through the search engine, search and book available hotel rooms. Apart from that, they can also find information about the services offered by the hotel and the contact form.

As we can see in Fig. 4, the availability search engine is found only on the homepage of the site. In order to make the reservation, the user is asked to provide his/her personal details and email address. The payment method is added to the app and indicates what the hotel accepts as a payment for the duration of the residence. After the user has completed the reservation, he/she receives a confirmation message via email with the details of the reservation.

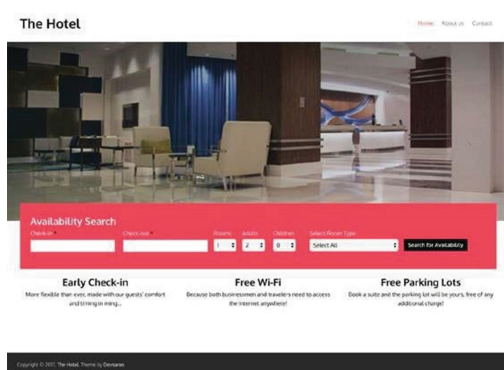


Fig. 4. Interface for searching and booking accommodation

3.2.1 Bookings Management

In the booking management part (Fig. 5), the manager can inform the customers about any updates regarding their reservation, manage the procedures for black swan events, and send mass or individual messages to the customers.

The screenshot shows a dashboard with several key sections:

- Bookings Table:** A central table listing reservations with columns for Booking ID, Customer, Arrival/Departure, Room/Booking type, Num. of People, and Operations link. It includes filters for 'Arriving after' and 'Departing after'.
- Weather Forecast:** A panel showing a 5-day forecast with icons for sun, clouds, and rain, along with temperature and precipitation percentages.
- Social Disaster Alerts:** A panel displaying various emergency alerts such as 'Gas, electricity 24-hour number' and 'NS International'.
- Emergency Contacts:** A panel providing contact information for police, gas, electricity, and transport services.
- Evacuation Plans:** A panel containing text instructions for evacuation procedures, including instructions on how to use fire extinguishers and what to do in case of an earthquake.

Fig. 5. Booking management form

4 Conclusion

Black swan events or Low Probability High Impact Events (LoPHIEs), like wildfires, earthquakes and volcanic eruptions, have significant implications to the hospitality and travel industry; a vivid demonstration of the complexity of interconnections between

organizational units involved in or affected by LoPHIEs are outlined in this paper through a case study. Appropriate preparations for hospitality and travel SMES to such events have been identified and implemented through a purpose specific information system. To design this platform, we followed a requirements analysis methodology. The main elements from the implementation of this platform have also been included, and elements of an initial usability evaluation have also been presented.

For future development, it is foreseen that novel technological methods and tools that have the potential to handle large volumes of information, fuse heterogeneous data from multiple sensing systems and take fast decisions at critical turning points must be examined in more detail.

References

- Armstrong, J.S.: Findings from evidence-based forecasting: methods for reducing forecast error. *Int. J. Forecast.* **22**(3), 583–598 (2006)
- Berg, J.E., Neumann, G.R., Rietz, T.A.: Searching for Google’s value: using prediction markets to forecast market capitalization prior to an initial public offering. *Manag. Sci.* **55**(3), 348–361 (2009)
- Coombs, W.T.: *Ongoing Crisis Communication: Planning, Managing, and Responding*, 2nd edn. Sage, Los Angeles (2007)
- Coombs, W.T., Holladay, J.S.: *PR Strategy and Application: Managing Influence*. Blackwell, Chichester (2010)
- Diakou, C.-M., Kokkinaki, A.I.: Enabling sustainable development through networks of collective intelligence. In: 4th Conference of the IDRiM Society, 4–6 September 2013. Northumbria University, Newcastle (2013)
- Fildes, R., Goodwin, P., Lawrence, M., Nikolopoulos, K.: Effective forecasting and judgmental adjustments: an empirical evaluation and strategies for improvement in supply-chain planning. *Int. J. Forecast.* **25**(1), 3–23 (2009). <https://doi.org/10.1016/j.ijforecast.2008.11.010>
- Goodwin, P., Wright, G.: The limits of forecasting methods in anticipating rare events. *Technol. Forecast. Soc. Change* **77**, 355–368 (2010)
- Halder, B.: *Approaches of Humanitarian Crisis Management - Associated Risks with the ICT-based Crowdsourcing Paradigm* (2015). Available at SSRN: <http://ssrn.com/abstract=2568233> or <http://dx.doi.org/10.2139/ssrn.2568233>
- Hergert, M.: The effect of terrorist attacks on shareholder value: a study of United States international firms. *Int. J. Manag.* **21**(1), 25–28 (2004)
- Jakoubi, S., Tjoa, S., Quirchmayr, G.: Rope: a methodology for enabling the risk-aware modelling and simulation of business processes. In: ECIS 2007 Proceedings (2007). Paper 47
- Onkal, D., Gonul, M.S.: Judgmental adjustment: a challenge to providers and users of forecasts. *Foresight* **2**, 13–17 (2007)