Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Management

Diploma Thesis

Project Management of Marketing Communications Events with the Use of Econometric and Decision-Making Techniques

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Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

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Economics and Management

Thesis title

Project management of marketing communications events with the use of econometric and decision-making techniques

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Objectives of thesis

The main aim of the diploma thesis is to bring innovations into the project management of events within the Marketing Communications department at ŠKODA AUTO a.s. by bridging the gap between the project management of events, and econometric as well as decision-making techniques.

Methodology

The work consists of two parts – theoretical and practical.

The theoretical part will be based on the study of secondary sources, namely studying the scientific literature, corresponding Czech and foreign journals as well as relevant Internet sources.

The empirical part will be compiled on the basis of outputs from quantitative/qualitative research. The analysis of a current situation regarding the project management of marketing communications events will be based on the internal information gained at ŠKODA AUTO a.s. (internal documents, participating observation, interviews). The innovative use of modeling, simulation and forecasting within the project management of marketing communications events at ŠKODA AUTO a.s. will be demonstrated using Microsoft Excel and the statistical software XLSTAT.

The proposed extent of the thesis

Approx 60 – 70 pages

Keywords

Project, project management, event, event management, marketing communications, econometric techniques, forecasting, modeling, simulation, decision-making

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Recommended information sources

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Expected date of thesis defence

2015/16 SS – FEM

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Declaration

I declare that I have worked on my diploma thesis titled "Project Management of Marketing Communications Events with the Use of Econometric and Decision-Making Techniques" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any third person.

In Prague on 30th March 2016 _____

Kristýna Kučírková

Acknowledgement

I would like to thank Ing. Richard Selby, Ph.D. for his priceless advice and support during my work on this thesis, as well as my colleagues and co-workers from ŠKODA AUTO a.s. for their help and providing me with all necessary background materials.
Special thanks go to my family who supported me persistently the whole way through my studies.

Project Management of Marketing Communications Events with the Use of Econometric and Decision-Making Techniques

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Projektové řízení akcí marketingové komunikace s použitím ekonometrických a rozhodovacích technik

Summary

The diploma thesis fills in the knowledge gap between the project management of marketing communications events at ŠKODA AUTO a.s., and the simultaneous use of econometric as well as decision-making techniques when preparing events. The theoretical part is compiled of findings on project management, event management, and econometric as well as decision-making techniques, followed by the empirical part consisting of an overview of ŠKODA AUTO a.s. with the focus on Marketing Communications department. The own work comprises of the project management identification which is based on the outputs from quantitative and qualitative research. The results of the reseach are further applied within the demonstration of the practical usage of econometric and decision-making techniques on the examples of events tailored for ŠKODA AUTO a.s. company.

Souhrn

Diplomová práce vyplňuje mezeru ve znalostech mezi projektovým řízením akcí marketingové komunikace ve ŠKODA AUTO a.s. a současným využitím ekonometrických a rozhodovacích technik při plánování akcí. Teoretická část je sestavena na poznatcích ohledně projektového řízení, řízení akcí, a ekonometrických a rozhodovacích technik, následována empirickou částí skládající se z přehledu společnosti ŠKODA AUTO a.s. se zeměřením na oddělení Marketingové komunikace. Vlastní práce se skládá z identifikace projektového řízení založeného na výstupech z kvantitativního a kvalitativního výzkumu. Výsledky výzkumu jsou dále použity při demonstraci praktického použití ekonometrických a rozhodovacích technik na příkladech akcí vytvořených na míru společnosti ŠKODA AUTO a.s.

Keywords: Project, project management, event, event management, marketing communications, econometric techniques, forecasting, modeling, simulation, decision-making.

Klíčová slova: Projekt, projektové řízení, akce, řízení akcí, marketingová komunikace, ekonometrické techniky, prognostika, modelování, simulace, rozhodování.

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1 INTRODUCTION

With today's technology, companies are able to collect tremendous amounts of data with relative ease. However, the data are usually meaningless until they are analyzed for trends, patterns, relationships, and other useful information. Companies compete in a global economy and that requires strategic decisions in every aspect of the corporate structure – from production and inventory to purchasing, marketing, communications, finance, accounting, personnel and services. Companies are aware of the need to operate successfully in the dynamic global market, and therefore are looking for ways to improve their decision-making processes.

Econometric and decision-making techniques can be used to analyze data and thus help clarify important business decisions. Moreover, the combination of quantitative techniques and management science gives the power and flexibility to analyze and solve a wide range of business problems.

Within more and more demanding business environment, project managers can no longer pass all of the quantitative analyses to technical specialists who have traditionally done the large data processing. A quantitative analysis is becoming an integral part of the entire project management, including the project management of events.

Project managers are nowadays in charge of building analytic models to help the company increase profits, reduce costs, or manage operations more efficiently. By all these means, the company gains a desirable competitive advantage in the current rapidly changing marketplace.

Using the quantitative techniques such as modeling and scenario-based planning can help project managers deal with uncertainty, and thus make better decisions. Simulation can run the gamut of plausible outcomes and can be used to develop a wide range of plans from tactical contingency planning to fundamental changes in business strategy caused by global paradigm shifts.

Every organization, public or private, operates in an uncertain and dynamic environment with imperfect knowledge of the future. The part of successful business leadership comes from an ability to foresee future developments and to make the right decisions. Whether project managers work for a multinational corporation, a small company, a government agency, or a not-for-profit organization, in virtually every decision they make some kind of forecast is considered. Predictions of demands and trends are no longer luxury items, but a necessity, if project managers want to cope with seasonality, sudden changes in demand levels, price-cutting maneuvers of the competition, strikes, and large swings of the economy.

Forecasting techniques can be used as a tool to guide business decisions. Even if forecasters are not completely certain of what will happen in the future, they can reduce the range of uncertainty surrounding a business decision. The objective of forecasting is to provide project managers with information that will facilitate their decision-making.

Project managers must rely on personal experience and professional judgement in choosing a particular methodology. The art of forecasting is in recognizing when the forecast is needed and how to incorporate qualitative and quantitative data in the forecasting process. Forecasting, as well as other econometric and decision-making techniques, are the means of supplementing common sense managerial decisions.

2 OBJECTIVES AND METHODOLOGY

2.1 Objectives

The main aim of the diploma thesis is to bring innovations into the project management of events within the Marketing Communications department at ŠKODA AUTO a.s. by bridging the gap between the project management of events, and econometric as well as decision-making techniques.

To fulfill the main objective, it was necessary to set sub-goals consisting in:

- ✓ classifying theoretical knowledge about project management of events as well as econometric and decision-making techniques,
- ✓ providing a concise overview of the Marketing Communications department at ŠKODA AUTO a.s. and of the company as a whole,
- ✓ identifying the project management of events within the Marketing Communications department and in case of finding shortcomings providing a solution leading to their elimination,
- ✓ demonstrating econometric and decision-making techniques on the examples tailored for ŠKODA AUTO a.s. and explaining the benefits of given techniques for the practical usage,
- ✓ providing project managers of marketing communications events at ŠKODA AUTO a.s. with the sufficient theoretical as well as practical knowledge of applying econometric and decision-making techniques, such as modeling, simulation and forecasting.

2.2 Methodology

The work consists of two parts - theoretical and practical.

The theoretical part is based on the study of secondary sources, namely studying the scientific literature, corresponding Czech and foreign journals as well as relevant Internet sources.

The empirical part is compiled on the basis of outputs from quantitative/qualitative research. The analysis of a current situation regarding the project management of marketing communications events was based on the internal information gained at ŠKODA AUTO a.s. (internal documents, participating observation, interviews).

As a quantitative method of data collection, the questionnaire survey of Czech as well as international students was conducted. As part of qualitative methods, the participating observation within ŠKODA AUTO a.s. company, and two standardized interviews, the first one with the project manager of the Marketing Communications department at ŠKODA AUTO a.s., and the other with the managing director of Volkswagen Group Import Company Ltd. China., were used.

Standardized interviews were carried out electronically via e-mail. Interviews, composed of semi-closed questions, served as a background material for comparing the styles of the project management of events within two multinational corporations and thus enabled a global view of the issue being addressed. Along with participating observation the standardized interviews contributed to a more objective way of assessing (and the identification of) the project management of marketing communications events at ŠKODA AUTO a.s.

The questionnaire was designed in Qualtrics research software and distributed among both Czech and international students via social network, namely Facebook social networking service. The questionnaire was in English and consisted of both closed and open questions.

Firstly, the questionnaire was sent to the pilot group consisting of 3 students to identify possible omissions. Subsequently, the questionnaire was distributed to the target

group of Czech and international students. The questionnaire was distributed within the period of 25 – 29 January 2016 and the total number of 142 questionnaires was distributed, 24 (16.9 %) of them were started, but not completed, therefore not applicable for further research. The total number of completed questionnaires was 118, thus, the questionnaire return rate was 83.1 %.

The innovative use of modeling, simulation and forecasting within the project management of marketing communications events at ŠKODA AUTO a.s. was demonstrated using Microsoft Excel, its add-in Solver and the statistical software XLSTAT.

According to the answers from the questionnaire, the modeling of an event was conducted. Afterwards, the different scenarios of the event were simulated and the possible profit for ŠKODA AUTO company was calculated.

The practical demonstration of the forecasting technique was based on the data concerning Geneva International Motor Show with the use of Holt' exponential smoothing method and One-sample runs test.

3 THEORETICAL PART

The chapter summarizes findings on project management and event management, which are the bases within the field of the project management of events, and only after mastering stated knowledge it is possible and advised to proceed to a higher level represented by the use of econometric and decision-making techniques within project management, described further in the given chapter.

3.1 Project and Project Management

Project is defined as *"a unique process, consisting of a series of coordinated and controlled activities with dates of commencement and termination carried out to achieve a predetermined goal that meets specific requirements, including the constraints of time, costs and resources"* (Jarolímek, Polášek, 2013).

For its uniqueness and temporary nature, the project should not be confused with a process that includes a number of automated actions that are repeated in every process. However, it may be stated that the project is composed of processes. According to Svozilová (2011) the project consists of five main groups of processes, namely the process of initiation and commencement, planning, management and coordination, monitoring and control, and finally the closure process.

The definition also states that the project is temporary. The project is limited by the time of commencement and the termination time, therefore, it has the beginning and the end. At the end of the project the objective of the project should be achieved. In addition to time constraints, the project is also limited by financial, human or material resources (Jarolímek, Polášek, 2013).

Fiala (2008) claims that besides mentioned features, the project is characterized by a high degree of uncertainty, which is mainly the subject of risk management.

Thus, project management means the managing of projects. Projects can be managed by the company and headed by the project manager. On the other hand, an external implementer of the project can be used as well.

3.2 Event and Event Management

A specific type of the project is an event. Šindler (2003) defines the event as follows: *"An event is a special occasion or an exceptional experience that is experienced by all the sensory organs of selected recipients at a particular place and serves as a platform for business communication."*

It is not always a matter of a corporate event. Then it is advisable to introduce another definition: *"An event is an occasion that should trigger experience or experience of emotional nature in order to gain the attention and interest of the target group within the communication of the company or another entity"* (Vysekalová, Mikeš, 2010).

Generally, objectives of events are as follows (Lattenberg, 2010):

a) Providing new information
b) Giving people together
c) Launching a new product
d) Evaluating partners
e) Gaining public awareness and recognition
f) Reminding company logo or anniversary
g) Creating own community
h) Increasing the loyalty of employees and their families.

As far as event management is concerned, the Association of Public Relations Agencies (APRA, 2015) defines event management as *"the preparation and organization of special events to promote the company's image such as social events, the celebration of the anniversary of the company, etc."* This definition corresponds mainly to corporate events, so it is appropriate to introduce the definition of a certified specialist in the field of events, Julia Rutherford Silvers, who describes event management as *"a process of planning,*

preparation and implementation of events". An event manager is then the person who organizes the event in all aspects, i.e. he/she is involved in the research, planning, organizing, implementing, monitoring and evaluating (Silvers, 2012).

3.2.1 Typology of Events

The typology of events in the literature varies a lot. For unique and unrepeatable events, it is not easy to portray a universal, yet comprehensive list of all possible kinds. The most comprehensive overview of the typology of events is considered to be the one introduced by Šindler (2003). His findings are transferred to the summary table and complemented with a couple of examples (see Table No. 1).

Table No. 1: Typology of Events

According to content	According to target groups	According to concept	According to place	According to accompanying experience
• **Work** (trainings, meetings) • **Informative** (new products introduction) • **Amusingly oriented** (company party)	• **Public** (fairs, festivals) • **Company** (teambuilding)	• **Utilizing opportunities** (party to the anniversary of the company) • **Brand/Product** (launching new products) • **Image** (place or the content of an event corresponds to values typical for the brand – Red Bull promotion) • **Know-how** • **Combined** (Coca-Cola trucks in a Christmas advertising)	• **Outdoor** • **Indoor**	• **Culture** • **Sport** • **Nature, etc.**

Source: Šindler (2003)

3.2.2 Event as a Marketing Communications Tool

If the event is used within marketing of a company, then it is called event marketing. It refers to experience marketing and it is a specific tool of marketing communications whose main subject is the event. The most important function of event marketing is to increase the popularity of the brand, the company, ideas or other communication facilities, and it is through the induction of positive emotions and positive perception of the organized event.

The basic prerequisite for a successful event is the choice of such a concept of the event, which attracts audience and motivates them to participate. Its effect increases if the event target group participates actively. The greater the active involvement of the target group is, the more positive emotions are caused by the event (Karlíček, Král, 2011).

If the intended event is the subject of marketing, then it is advisable to carry out its first situational analysis. Therefore, it is necessary to determine whether the event is a suitable communication tool. Furthermore, it is also important to assess whether the event is competitive with other events, whether it can meet demand requirements and whether there exist sufficient available resources to its implementation. The most common form of the analysis is the SWOT analysis, i.e. the evaluation of strengths, weaknesses, opportunities and threats of the event through answers to the following questions:

1) Is the event an appropriate communication tool?
    a) Will the event help achieve given objectives of the company?
    b) Is there a good opportunity why to implement the event (e.g. anniversary of the
    c) company)?
    d) Would another instrument of communication mix be proper?
    e) What is the experience with such a form of communication so far?

2) What is the supply and demand for the event?
    a) What is the competition among events, which are the most popular forms of events?
    b) On the demand side - what are the needs and values of the target group?

3) Has the company enough financial, human and material resources for the realization of the event?
    a) How much money will be necessary to implement the event?
    b) Are there enough employees to implement the event? Do they have adequate experience for the implementation of the event?
    c) What will be the material security of the event?
        – spaces of the implementation
        – necessary equipment
        – infrastructure
        – technical equipment (sound, light, etc.)
        – transport
        – catering
        – accommodation
    d) Would it be better to use outsourcing (e.g. event marketing agency)? (Šindler, 2003).

Hoyle (2002) states that if it is found on the basis of the situational analysis that the event is the right communication tool, then it is followed by planning its details. When planning, it is important to design an appropriate marketing mix, i.e. 4 (5) P - product, price, place, public relations and positioning.

The product means the actual event. During its specification, answers to the following questions are crucial (Hoyle, 2002):

1) Has the organized event any history?
    – Does it relate to any anniversary? What about the tradition?
2) What is its value for visitors?
    – What will they experience during the event? Will it satisfy their needs?
3) What makes the event unique?
    – Why should people participate in the event? What is its difference from other competitive events?

The price of the event should be consistent with the financial strategy of the company. Events can be organized with the aim of getting profit, however, there are often implemented events without the expectation of profit. Thus, the firm by organizing the event follows some future benefits (e.g. increasing clientele). Then the price of the event can be understood as a cost of business. In both cases, the price is often governed by the affluence of target participants (e.g. if the target group of the event is represented by managers of companies who credit expenses to the account of their employers, then the price of the event will be higher than for those paying from "own wallets").

The choice of a right place for the event is crucial both for the attendance rate and for the character of the event. When choosing a place, it is appropriate to take into account the following points (Hoyle, 2002):

- Transport accessibility for visitors
- Parking
- Atmosphere and originality of the place
- Practicality in terms of directing the whole event
- Places of interests around
- Existence of related organizations
- Degree of interconnectedness of the place and nature of the event
- Safety of participants
- Public transport availability
- Required spaces (for sleeping, for holding the meeting, etc.)

According to Vysekalová (2012) the aim of public relations (i.e. working with the public) is to create a favorable climate, gain a liking and support of the public and institutions which may affect the achievement of marketing goals. Positive public relations are often more valuable than traditional costly advertising and can generate more favorable values in all aspects - from profits, through the attendance of the event to new business partners.

Svoboda (2009) states that the instruments of public relations are mainly the press articles and conferences. In the case of events, press releases, in which the event organized by the company is described, are written.

Tomandl (2011) adds that this report could be free of charge for the company if the event is so interesting that it attracts the attention of journalists who gladly write about it by themselves.

The last component of the marketing mix is positioning. It is a strategy to identify consumer needs that could be satisfied by the event. The intuition, research and subsequent evaluation are used to its determination. The aim of positioning is to fill the gap that is in the market and differentiate oneself from the competitors as well. For events, the following strategy is important (Hoyle, 2002):

- Appropriately determine the location of the event
- Attract the attention of potential visitors (emphasis on the satisfaction of needs due to the participation in the event)
- Establish adequate entrance fee (some events are free of charge for low-income target groups and are funded by sponsors, exhibitors etc., other events can be targeted to people with high incomes, for whom the high entrance fee is a sign of luxury that they can afford)
- Devise a unique program of the event
- Stick with the motto: "Simplicity is beauty."

3.3 Initiation and Project Launch

Project management includes a number of methods and procedures that are pillars of the project. They give the project a clear framework and provide better orientation in various areas related to the project, from the very beginning of the project until its completion. The project is a set of processes: initiation-commencement, planning, management and coordination, monitoring and control, and finally closing the project (Svozilová, 2011).

The project begins by its initiation and commencement. Trigger mechanisms of the project may be market opportunities, strategic business needs, customer demand, the development of a new product or technology or legal requirements. Such a trigger element of an event can be for instance a completed development of a new group of products, which is intended to be introduced through seminars holding, or the need to extend brand awareness.

The outcome of the first phase of project management is the project charter with a preliminary definition of the project subject. According to Svozilová (2011) the project charter should include the following specification:

1) What is the project about (name of the project, its objectives)?
   - In the case of events, the project means the implementation of a particular event, whose goals may be sales support, strengthening relationships with customers, etc.
   - E.g. the organization of staff training, corporate Christmas party

2) Who is responsible for the realization of the event?
   - Does an event manager work in the company? Or is it necessary to build a temporary production team, or to make use of outsourcing and the event will be held by specialized event marketing company?

3) What is the scope of the powers of event manager and what is his/her place in the organizational structure?
   - Is an event manager solely responsible for the realization of the event or does he/she carry out the work together with his/her colleagues?
   - What is his/her decision-making freedom?
   - Whom he/she is subordinate?
   - Who can be assigned with tasks? Who makes line management?

   - What relationship does he/she have to the sponsor of the event? (i.e. the person who initiated the event and will finance it is usually a superior to the manager of

the event, the sponsor may be a customer who orders the implementation of the action)

4) What are conditions and limiting criteria for the implementation?
   - What is the schedule of the project?
   - The size of the funds?
   - Available material resources?

Regarding financial constraints, it is necessary to preliminarily quantify the costs within the project budget. It consists mainly of:

1) Costs for human resources managing and implementing the project
2) Costs for the purchase or rental of technology and equipment
3) Supply costs
4) Overheads of the company (those that cannot be clearly assigned only to the creation of the project)
5) Costs for the risk coverage of the project
6) Profit of the project contractor (i.e. if the project is not managed by the company itself)
7) Price adjustments due to market conditions, etc.

Svozilová (2011) adds that the price of the project also reflects its amount of risk. If it is of a high-risk, then it is necessary to quantify more financial reserves for risk factors of the project. The high degree of riskiness of the project will also be reflected in the consistent arrangement of conditions and obligations of the contract, if the project is supplied externally. Based on the risks, it is also necessary to determine the method of determining the project price.

The preliminary definition of the subject of the project mainly includes defining project goals. Furthermore, the cause of the request for the project can differ from the approaching date of the anniversary of the company, through the training of employees due

to the lack of their knowledge, to the need to increase revenues through participation in the fair.

3.4 Project Planning

After the initiation phase, the process of project planning follows. Its output is particularly the definition of the subject of the project and a project plan. The definition of the subject of the project is more specified preliminary definition of the subject of the project from the initiation phase. It answers questions: What is the aim of the project? What is the subject of the project? And last but not least, what will the subject of the project serve to? It means the strategic plan with which the project is carried out, a list of partial aims and outputs of the project, including the limits, budget or time constraints, legal and environmental regulation and quality requirements for the subject of the project (Svozilová, 2011).

The definition of the objective of the project is a very crucial task. From formulated objectives, other procedures are reflected such as planning documents and the final evaluation of the project success. When defining objectives, SMART technique, which states that the objectives should be Specific, Measurable, Achievable, Realistic and Time-bound, will help (Doležal, Lacko, Máchal, 2009).

The project plan says what the procedure will be within the project, what work will be performed, what approaches and methods will be used - that is what the strategy for the project management is (Bureš, Šedivý, 1994). Furthermore, the planning of the project deals with the question when we want to achieve it, who should achieve it, for how much, what risks need to be considered, whether we have available resources and what control procedures will be performed (Dolanský, Měkota, Němec, 1996).

For the definition of the subject of the project, which specifies the purpose of the project, its objectives, outputs and activities required to achieve objectives, and furthermore for the creation of a project plan, the logical framework of the project can be used.

3.5 Logical Framework of the Project

A logical framework of the project consists of the table, in which the purpose of the project and selected activities, through which its feasibility is ensured, are stated. This framework is appropriate to be monitored not only when planning the project, but also during its implementation and the following control.

According to Štefánek (2011) the logical framework includes intention, objectives, outputs and activities. The implementation of the event can be described as the outcome of the project. It is therefore necessary to consider what the company wants to achieve by the event. That is, what is the purpose of the event? Is it for instance increasing the number of business partners or improving staff qualifications? In order the intention of the project could be defined, it is necessary to answer the question why the company wants to achieve that objective. Thus, for example, why do they want more business partners? Is it because the company wants to for instance take a better position in the market or because it wants to increase the turnover?

Recommended process of creating a logical framework is as follows (Štefánek, 2011):

1) Definition of project objectives
2) Determination of the intention
3) Determination of the specific outcomes of the project to achieve the objective
4) Specifications of the activities leading to the achievement of outputs
5) Verification whether the vertical logic through the test "if - then" is observed
   - i.e. if key activities are implemented, the result will be specific outcomes that help attain the objective that contributes to the fulfillment of the project
6) Determination of objectively verified indicators/timeframe
7) Defining the means/methods of verification
8) Setting preconditions required at each level
9) Quantifying costs for activity realization - budget implementation.

3.6 Work Breakdown Structure

Project objectives and activities which lead to the achievement of given objectives can be organized into a detailed work schedule, or into the hierarchical structure of activities (Work Breakdown Structure, abbr. WBS). This method is used to facilitate management. Defined objectives should be broken down into more specific parts, until the desired level of detail is achieved. Then they are assigned the required workloads. The correct sequence of steps in order that they were in sequence (i.e. as soon as one task is accomplished, it is possible to proceed to the next task - higher level of itemized work is the sum of work at lower levels) must be observed (Svozilová, 2011).

However, in managing the project, the project manager should not focus too much on planning sequences of sub-activities, instead of concentrating on fulfilling objectives of the project. This is called the "trap of planning sequences of sub-activities." It is always necessary to observe whether the integration of tasks leads to the fulfillment of objectives of the project (Rosenau, Githens, 2005).

The number of levels in the WBS is given by the complexity and scope of the project. To determine the appropriate level of the WBS is not a simple task of the manager. If the structure is not properly divided, there is a danger that something can be forgotten, and it is difficult to detect possible risks. Conversely, too much detailed structure causes that the project escapes as a whole. Also, it is then harder to maintain the independence of individual tasks. If the project is a part of a wider program, then standard 6 levels of itemized work are created. A hierarchical structure diagrams with blocks or Gantt chart can be also used. An appropriate software (e.g. Microsoft Project) can help with the creation of such diagrams (Svozilová, 2011).

Besides giving specific wording of the objectives and activities it is possible in creating the WBS to state for each objective or task estimated costs, duration or organizational unit responsible for that task.

Basic building block of the WBS is a task. According to Svozilová (2011) each task should meet the following basic principles:

1) A clear specification of the assignment and the desired result. The minimum interaction with other tasks.
2) An estimated labor intensity is determined (e.g. number of days), while the ideal time-consuming task is 80 hours and its implementation should not exceed 4 weeks.
3) It is included in the chronology of the project, i.e. it contains time indication when it is to be executed (deadline of implementation is set, to what task it is a follow up, etc.)
4) The responsible person (or group of persons), who is entrusted with its implementation or the delegation to another person or group of persons, is determined.

If the tasks are set according to these rules, their results can be easily compared with assumptions – i.e. comparison in terms of time, drawn costs, achieved results and quality of execution.

Karlíček and Král (2011) state that individual tasks in the development of events might be the following activities:

- formation of the team
- creating an information campaign (advertising, media relations, direct marketing - direct mail or e-mail, information on the website)
- staffing the event (e.g. hostesses)
- technical support (e.g. sound, visual equipment, lighting)
- providing refreshments (catering)
- ensuring the safety (security, medical services, fire protection)
- providing accommodation for guests
- securing permission to hold the event from the owner of the land or premises
- selection of appropriate music production and the fee for public music production
- ensuring an appropriate presenter
- ensuring a celebrity, who would increase the attractiveness of the event
- ensuring a photographer, alternatively a cameraman

- ensuring decorations,
- ensuring gifts for guests
- ensuring facilities (e.g. toilets, cloakrooms).

The above list of tasks shows that events are organizationally very demanding. These activities need to be properly planned, managed, coordinated and controlled. The company is able to secure those activities either by itself, or it uses the services of contractors. If they use outsourcing, then it is appropriate for all suppliers to communicate only with one person from the company. This avoids any possible confusion arising from multiple communication parties.

3.7 Time Schedule of the Project

When planning a project it is necessary to establish a timetable of steps of the project, which will encompass the deadline for the work, in what time sequence it will be done and who is responsible for the task. The timetable is drawn up in the form of diagrams and schedules, of which the simpler ones are for example Gantt charts and diagrams milestones.

The author of Gantt charts is Henry L. Gantt, who easily illustrated the sequence of tasks along with their beginnings and ends, while tasks are usually performed from the top to the bottom. Disadvantages of Gantt charts can be seen in the fact that they do not enable to consider what will happen if there occurs a change in the course of the project, and that they do not illustrate dependence among single tasks. However, this negative aspect is solved by using Gantt charts with arrows by means of which it is possible to illustrate the link among individual activities. Gantt charts can illustrate an expected schedule of activities and the reality as well (Svozilová, 2011).

Svozilová (2011) states that the diagram of milestones is even simpler. Milestones are a simple time data, which are bound to certain events (e.g. project initiation, completion of the project), usually it is an activity with zero duration. The disadvantage of a diagram is that it does not show concretized tasks and the length of their duration. Thus, the overlapping of single activities cannot be interpreted.

The deficiencies of given basic time diagrams are solved by network diagrams. These include for instance a method of Program Evaluation and Review Technique (PERT), Critical Path Method (CPM) or Arrow Diagrams Method (ADM). Svozilová (2011) adds that the usage of these methods is relevant mainly for larger, more demanding projects than events, and because of their complexity it is suitable to use a software tool.

The schedule is recommended to be based on a work breakdown structure, whose activities are in the time sequence. Each operating zone must be adjoined with the length of its duration, including time reserve. Pakosta (2007) defines the procedure of creating the schedule is as follows:

1) Creation of itemized activities
2) Transfer of the hierarchy of activities to the appropriate diagram format
3) Proposing the sequence among single sub-tasks
4) Estimation of the duration of individual tasks
5) Determination of time reserve.

According to Svozilová (2011) to estimate the time consumption of individual tasks, the calculation of expected duration values can be used:

Expected duration value = [Optimistic Time + (4 x Probable duration) + Pessimistic Time] / 6.

The schedule is needed to be optimized as much as possible. General requirements for optimizing the schedule are following:

1) Ideal length of terms, and its observance
2) Lowest costs
3) Minimum risks.

Schedule optimization can be done by several methods. The method of accelerated passage route is used to shorten the duration of the project. It is based on the principle of running multiple tasks simultaneously or in a partial overlap. However, speeding the project, however, increases the risks of the project and the coordination and control is then more difficult. If the speeding requires due to the lack of capacity the increase in resources (human resources, extension of working time, purchasing additional equipment), then it is necessary to consider whether this increase will be reflected too much in the costs of the project. Another method of optimizing the schedule in order to shorten the duration of the project, is the method of trimming time at zero or minimum impact on project costs (Svozilová, 2011).

3.8 Planning Human Resources of the Project

If both a work breakdown structure and a time schedule are done, then it is necessary to answer the question who will carry out single activities. To determine the necessary staff team, the WBS can be used. It is possible to deduce from it who will be needed for the creation of the event and what relationships among staff will function. According to these specifications, the organizational structure of the project can be proposed.

At the forefront there is usually a project manager, for events it is a so-called event manager. He/she is responsible for managing the event so as to achieve its objectives, namely compliance with all specified limits of the project (partial objectives, time and costs). The event manager is responsible for managing the resources of the event (time, human, material and financial), tries to identify and minimize risks of the event and looks for optimum solutions of problematic situations, coordinates and integrates partial activities of individual entities, manages relations between the event and its surroundings (i.e. the stakeholders). If it is a small-scale event (e.g. a half-day seminar for employees of the company), then the event manager can organize such an event by himself/herself. But if it is a challenging event, it is necessary to establish the entire implementation team (Lattenberg, 2010).

Event managers may manage even line managers responsible for specific areas (e.g. marketing manager, HR manager). Line managers assign tasks to individual workers, and

are also responsible for engaging the positions with people with appropriate skills and required abilities (Lattenberg, 2010).

Barker and Cole (2009) state that besides the control components of the project, it is necessary to determine an executive team that is involved in the actual implementation of the event. Individual members of the executive team carry out their tasks on the basis of the delegation of a task or the authorization to work. It is appropriate to determine the deadline for individual tasks and to specify tasks by the rules mentioned above.

According to Lattenberg (2010) the executive component of the event is mainly individuals that will be present during the event. They are mainly service staff and those persons providing the program. Within the service it is necessary to secure for instance a parking attendant as well as pleasant hostess with a representative behavior who assist in organizational activities, such as welcoming and registration of guests, introducing them to the table according to the seating, giving gifts, and a final farewell to guests. Qualified staff for the refreshment must also be ensured.

Lattenberg (2010) adds that it is also necessary to identify persons who will participate in the event program. Sometimes, it is necessary to use an experienced presenter who will accompany the whole event, and who is responsible for the proper observance of the timetable of the event. According to available funds, it is selected between a publicly known person or a noncommercial one.

Hoyle (2002) suggests that the program may be further complemented by singing, dancing, sports or any other cultural experience. Furthermore, it is necessary to ensure the entire production, both the equipment and people who can handle with such an equipment. If the budget allows, it is beneficial to include into the program a celebrity. The celebrity will draw attention to both potential participants of the event and media.

According to the type of the event, other staff are used. During sporting events, referees, health professionals etc. must be ensured. It depends on the nature of the event (Hoyle, 2002).

At the beginning of the cooperation, each team should be given the duties, competencies and responsibilities to avoid conflicts, chaos and doing the same thing by more people. It is always necessary to keep in mind that the individual interests of the team members must be subordinated to the given project objective. Therefore, it is necessary to adhere to the management principle of "sharing the vision." Each member of the project team must know what the vision of the project is and what his/her work should be directed to. The appropriate way to share project information is arranging short, regular meetings (Davis, 2009).

If the company lacks its own staff the company can use suppliers. The use of such an interlink often brings many benefits - especially for their areas of expertise, lower costs and risk transfer. Relationships with subcontractors are managed on the basis of standard contracts between the two companies. With all suppliers should consider communicating Only one person, a kind of spokesman, should communicate with all suppliers (Hoyle, 2002).

3.9 Budget of the Project

In the initial phase of the project a preliminary budget is compiled, in the planning phase of the project it is necessary to propose a detailed budget. The budget must be specified as it will be fully binding. During the implementation phase of the project it can be possibly updated, however, this updating must be in accordance with the rules of the contract and with approved project documents.

Ahead of planning a certain event, a financial limit, which must be kept, is usually given. The nature of the whole event will depend on the budget. Based on the amount of the budget, offered services, invited persons, who will form the program of the event, the premises where the event will take place etc. will be decided (Rosenau, Githens, 2005).

The budget is made up of costs and revenues. During its formation it is possible to start with the specifications of the project costs (the work breakdown structure and schedule

of activities can help determine the costs) and then look for funds to cover them. The following are the types of costs (Tetřevová, 2006):

1) Direct costs
   - directly related to the project implementation
   - for the event direct costs could be as follows:
     - labor costs related exclusively to the event (e.g. the salary of event manager)
     - material - printed materials such as invitations, posters, badges, programs, gifts for guests, decorations
     - documentation of events (photographer)
     - entertainment (presenter, band, lecturer, etc.)
     - costs of other services (e.g. conference room rental)
     - purchase, lease of equipment
     - licenses and fees
     - costs of financing the project, etc.

2) Indirect costs
   - cannot be unambiguously assigned only to project, these are costs of the whole organization of which a certain percentage is assigned to the costs of the project
     - personnel costs (salaries of the company's management - the management does not only manage the project, but the whole organization)
     - the operating costs of company buildings
     - taxes and charges, etc.

3) Reserves
   - reserves for covering project risks
     - reserves created for identified risks
     - managerial reserve for unpredictable risks, etc.
   - sources of project risks can be: poorly defined requirements in the project assignment, the demand for the creation of original solutions, error estimation of labor intensity, labor market changes (staff turnover and compensation for higher prices), inflation and the subsequent changes in prices of labor, materials,

services, exchange rate fluctuations, the inexperience of the project manager and others.

When estimating costs it is necessary to adhere to the following principles (Rosenau, Githens, 2005):

- Firstly plan, then estimate - i.e. firstly to determine the duration of an activity, then assign it related costs.
- Carry out a cost estimate for each task - according to the WBS it is necessary to break down the project into sub-tasks and activities, and then assign costs to these sub-tasks.
- Count on inflation for long-term projects.

A specific area of costs is the purchase of a particular product or service. When calculating the costs of acquisition of these articles, the costs associated must not be forgotten (Doležal, Lacko, Máchal, 2009):

- Accompanying performance price (transportation, handling procedures, etc.)
- The cost of the purchase process (direct – e.g. time spent on the purchase of a given product, and indirect – e.g. the strategic management of purchases)
- Operating costs (i.e. the costs of maintaining the viability of the product throughout the whole duration of the project).

There are several options for separating purchases. For creating events it is proper when planning purchases, to divide them according to the purpose of the purchased product (i.e. the costs of marketing, logistics, entertainment, etc.). Costs could also be categorized according to the stage of the event in which they will be used (Bureš, Šedivý, 1994):

1) Shopping for event planning (e.g. purchase of necessary software, the purchase of promotional materials)
2) Purchases for the realization of the event (e.g. projector, screen, flipcharts, microphones, the cost of entertainment, assembling the stage)

3) Purchases for the termination of the event (e.g. cleaning products or cleaning services).

3.9.1 Funding of Events

Sources of events funding are divided into three groups. According to Hoyle (2002) they are following:

1) Internal resources
   - equity
   - discounts obtained e.g. within large orders

2) External resources
   - loans
   - subsidy
   - sponsorship
   - dealers who participate in the event
   - promotion of partnership
   - license
   - merchandising
   - ticket sales, etc.

3) Client resources
   - If the event is held for a client, then the client is responsible for the funding. It depends only on terms and conditions if it will be paid for the event in advance (e.g. deposit), or after the meeting.

3.9.2 Event and Sponsorship

Sponsorship is the fastest growing form of marketing. Most sponsored events are sports events, then for instance art events and festivals (Hoyle, 2002). The sponsored event should match the brand of a sponsor. This means that the sponsor and the given event share

the same or similar values. For example "extreme" brand Red Bull is sponsoring extreme sports.

Sponsorship involves both the financial contribution and the provision of some material assets. The sponsor expects reciprocity, i.e. placing its logo on promotional materials and on the site of the event. However, for some sponsors, mere visual presentation is not sufficient and they are engaged in the self-promotion in another way, too. They are searching for the ways for the target audience to be informed about the partnership as efficiently as possible so that the sponsor brand may be actively involved into the event in an appropriate manner. For example, within the event they organize their own fun competition. It is also appropriate to ensure that the participants of the event came in contact with its products - sampling, the competition for products of a given brand or providing free products can be used. The effect of sponsoring is reinforced by the fact that they appropriately present the partnership within their marketing communications – for instance in the advertising campaign, on the web, on online social networks, or at the point of sale (e.g. a promotional flyer about a sponsored event) (Karlíček, Král, 2011).

3.9.3 Event and Subsidies

Other specific possibility of financing the event is the subsidy. The subsidy covers three groups of people. It is the provider of the subsidy, which is the entity responsible for managing the entire subsidy program (the calls for project applications, through the selection of the project, to checking implementation of the selected project) and the allocation of grant funds. Grant recipients are those who ask for a subsidy. The most frequent applicants for subsidies are mainly public entities, such as municipalities, regions, etc., or nonprofit organizations (foundations, civic associations). The third group of people affected by the subsidy is formed by users or target groups of the project. In general, the third party should benefit from the subsidy. This means that the project is beneficial not only to grant beneficiaries but also to other people (Tetřevová, 2006).

The request for a grant is administered through a standard form, which has mostly an electronic form. Mandatory and optional attachments are enclosed to this form. After filling in the details of the project, the project is assessed from the point of view of fulfilling

formalities of the request, conformity with stipulated criteria of acceptability and if the project is assessed at both levels successfully, then its score follows. At present, the evaluation criteria are generally known for applicants, and therefore, it is feasible to adjust the project according to them as much as possible (Tetřevová, 2006).

The success of the project application is ensured by absolutely clear and concise description of the project plan (Bureš, Šedivý, 1994). It should always give answers to these basic questions:

1) What does the company want to realize?
2) Why?
3) Where?
4) For how much?
5) When?
6) Who will realize it?

In the case that the project is selected for funding through grants, it is necessary for it to be complied with all prescribed principles to assure that the subsidy will be actually paid (Tetřevová, 2006). Those rules include:

a) Rules for public contracts
   - esp. Act no. 137/2006 Coll., on public contracts, provisioning rules program, principle of transparency, equal treatment and the ban of discrimination
b) Rules for the realization of the project
   - e.g. an obligation to establish a separate bank account, filing documents or reporting changes during project implementation
c) Rules of financial management and accounting of the subsidy
d) Rules for change management
e) Publicity rules.

However, even after the realization of the project, the duties of the applicant for the subsidy do not end. After the realization of the project, the so-called monitoring period or

period of the sustainability of the project starts. The functioning of the project is observed – i.e. promised outcomes and results of the project must be achieved during a set period after the realization of the project (Jarolímek, Polášek, 2013).

3.10 Communication Plan of the Project

To ensure effective communication in the project, it is appropriate to establish a communication plan, which can be arranged for instance into the table. Basic characteristics that the communication plan should not be missed are as follows (Svozilová, 2011):

1) What information will be shared - what is the name and purpose of the entry of the communication plan, i.e. WHAT will be shared and WHY?
2) What is the temporal periodicity of the information – i.e. WHEN / HOW OFTEN will the information be shared? Alternatively, what are the limits for the distribution and what for the response?
3) Who is responsible for the creation and distribution of the information – i.e. FROM WHOM the information goes?
4) Who should receive the information – i.e. TO WHOM the information is intended?
5) In what form will the information be distributed, by what media – i.e. HOW?

Table No. 2: Communication Plan of the Project

WHAT?	WHY?	WHEN?	FROM WHOM?	TO WHOM?	HOW?
Basic characteristics of the project	Sharing information on the project objectives	Depending on the needs	Project manager	Company management, project team members	Oral (MS PowerPoint), written (MS Word, e-mail)
Time schedule	Identification of working stages, their outputs and timing, cast individual stages by responsible persons	Depending on the needs	Project manager	Company management, project team members	Written (MS Word, MS Project)
The state of fulfillment of the task	Updating the state of the task according to the project plan and schedule	1 week	Project team members	Project manager	Oral, written (MS Word, MS Excel)
Negotiating of the project team	Coordination of tasks and mutual dependencies	2 weeks (every odd Monday)	Project manager, Assistant	Project team members	Oral (meetings, presentations)

Source: Svozilová (2011)

When all planning processes are completed, then it is the turn of the project management itself. In general, the management includes activities such as staffing, delegation, coordination, motivation, supervision, training and providing advice.

3.11 Risk Analysis

Every project is threatened by potential risks. Project risk is defined as *"an uncertain event or condition that, if it occurs, has a positive or negative effect on project objectives"* (Korecký, Trkovský, 2011). This definition implies that the risks are not only threats to the project, but also the opportunities. All project phases are accompanied by risks and they must be continually identified and evaluated.

According to Korecký and Trkovský (2011) the severity and nature of risks vary according to the project life cycle. In the initial stages of the project there are the greatest risks. Conversely, at the end of the project the incidence of risks decreases, their impact is owing to the already incurred costs great. The task of the project manager is to manage all the risks, so that the target or subject of the project could not be threatened.

The process of project risk management generally consists of the following activities (Korecký, Trkovský, 2011):

- Risk identification
- Qualitative risk analysis
- Quantitative risk analysis
- Defense strategy for risk management
- Monitoring of identified risks and the possible implementation of defense strategies.

3.11.1 Risk Identification

It is essential in order that as many stakeholders of the project as possible would be involved in the process of identifying risks. There is then greater certainty that some risk

will not be forgotten. To identify risks, the following methods can be utilized (Svozilová, 2011):

a) Lessons from historical projects
b) Brainstorming
c) Delphi Method
   – Individual experts create their own individual designs which are then presented to the entire group of experts. The process is repeated until the expert group reaches a consensus.
d) Individual discussions with specialists
e) Crawford Slips
   – Group of experts individually response to the question - no response may be repeated. Each answer is written on a slip of paper. In conclusion, the answers are discussed.
f) Root Cause Identification
   – The method focuses on identifying the problem and its causes. The aim is then to eliminate the causes
g) SWOT analysis
   – Identifying strengths, weaknesses, opportunities and threats.
h) Lists
   – Prepared forms with already identified risks (based on the results of other methods searching for risks), with indication of selected risks.
i) Diagrams
   – Ishikawa diagram (cause and effect diagram), flowcharts, network diagrams, etc.

It is based on the following information (Svozilová, 2011):

- Definition of the subject of the project and the work breakdown structure
- Schedule and budget
- Studies and expert opinions
- Historical information from similar projects.

3.11.2 Qualitative Risk Analysis

The qualitative risk analysis focuses on non-numeric specification of the risk. In the process of the qualitative risk analysis it is important to establish the cause - risk - effect. In the field of causes it is then necessary to design a preventive measure aimed at preventing (for threats), or spotting (for opportunities) so that causes gave rise to the risk. In the case of effects it is necessary to recommend reactive (risk response) actions so that after the fulfillment of a risk, the effect was prevented or minimized (for threats), or strengthened (for opportunities) (Korecký, Trkovský, 2011).

It is also necessary to identify the owners of risks (i.e. those responsible for further risk analyses and solution). The job title of the risk owner is used (e.g. project manager, project coordinator, coordinator of subcontracting, financial manager).

According to Korecký and Trkovský (2011) the qualitative risk analysis can also include the determining of the likelihood of the risk, the size of its impact on the project and its significance, in verbal expression. These may be formulated as High / Medium / Low or by the degree from the set of numbers of a selected interval (e.g. from 0 to 5).

3.11.3 Quantitative Risk Analysis

Compared with qualitative risk assessment, the quantitative risk analysis uses a numerical expression of risk indicators. Risks are quantified by means of the probability of their occurrence, the estimated value of the damage and the risk value.

The probability of risk emergence is calculated as: $P(A) = m / v$. Where m is the number of results of "favorable" occurrences of the phenomenon A, v is the number of all possible outcomes. In practice, however, the exact number of options is not known and further, they are not equivalent – i.e. among individual options there are various influences. The result is therefore rather distorted (Korecký, Trkovský, 2011).

According to Korecký and Trkovský (2011) the determination of the size of the impact of risks on the project (esp. financial implications, time delay) falls to the

quantification of risks. The indicator of their quantification is the expected value of risk. It enables to determine the significance of risks (i.e. risk score). The expected value of risk should be minimized. If the risk is opportunity, then the value of the expected profit brought by the opportunity is set into the calculation. It is calculated as *the estimated value of the loss (or gain) * the probability that the risk occurs*.

When the value of the anticipated loss is a financial valuation of the impact of the risk it is represented by costs, which are caused by the risk if it occurs. These costs are mainly the costs of changing the subject of the project or the costs associated with the delays of the project (additional salaries, penalties for failure to meet the deadline, etc.). All these costs are appropriate to be expressed in monetary units for better comparability between risks (Korecký, Trkovský, 2011).

For events, such calculation formulas are sufficient. However, if the project is more extensive, then it is necessary to use other methods of calculation, such as decision trees or Monte Carlo simulation (Svozilová 2011).

In the end it is useful for the quantitative risk analysis to determine what the limits of the acceptability of risk are. Thus, when exceeding the limits, it is necessary to intervene with corrective measures.

3.11.4 Defensive Strategies Against Risks

After the identification and analyses of risks, it is necessary to propose measures to minimize the risk, or at least limit the consequences of their impact.

Defensive strategies against the risks generally include the following (Korecký, Trkovský, 2011):

1) Rejection of the risk
   - this strategy does not admit the possibility of the acceptance of risk, so they are usually regulated by the conditions of the subject of the project so that the risk

did not occur (e.g. May bad weather significantly jeopardize the project? Then the event will not be organized outside but inside.)

2) Elimination/reduction of the risk
   – measures to reduce the likelihood or severity of risk
3) Acceptance of risk
   a) active - there is created a risk plan, which is triggered when the first indicators of risk appear
   b) passive - until the risk appears, nothing will be done to find a solution after the risk occurs
4) Transfers
   – transfer the risk to another party - the insurance company, suppliers, etc.
5) Creating a reserve
   – time, cost or in the size of critical resources

3.11.5 Detailed Risk Register

A method which will report on the potential risks the most practical overview of information (compared to other methods of risk analysis, e.g. Monte Carlo simulation method, sensitivity analysis, etc.) is the creation of a detailed risk register. The register is similar to the work breakdown structure. It includes full characteristics of individual risks, which are a summary of the outcomes of the entire risk management process. In compiling the risk register it is useful to use the same procedure as during a work detailed structure. For example, first the risks are divided by individual fields (e.g. the risk of legislation, technical) and they are also gradually described in detail in the form that is attributable to individuals (Korecký, Trkovský, 2011).

The detailed risk register is advisable to be kept for instance in MS Excel, where the data can be filtered for example by the owner of risks, it is possible for risks to be ordered by their significance, etc. Apart from the above table header, in the register may be specified the date of identification of risk, the minimum and maximum values of the impact of risk, including the risks to threats or opportunities, lessons from the risks useful for future projects and other important information (Němec, 2002).

3.12 Project Monitoring and Control

Controlling the project is an activity that accompanies the project immediately after the approved project plan, and the first implementation of work start. It is necessary to monitor whether the progress of the project corresponds to the established schedule and project budget. Mostly the predetermined limited budget is given and it is necessary to constantly monitor the development of cost items in order to observe the budget.

Monitoring and control is a process, which consists of three sub-tasks. According to Svozilová (2011) they are as follows:

1) Measurement - identifying specific values of the project.
2) Evaluation - whether those values observed are in accordance with the project plan and the definition of the subject of the project.
3) Correction - when there are undesirable deviations between assumptions and actual values, then it needs to be remedied.

To measure in the project scale (e.g. the size of project output, the time worked, the quality of the product – given for instance by the number of defects), which are divided into proactive and reactive are used. Reactive scale says, what was achieved in already completed process. If the expected value was not achieved, then it is usually necessary to involve some kind of "extra step" (e.g. the repair of defective output). Proactive scale is used when the process is still ongoing. Its output can thus have influence through corrective measures which may be e.g. increased work effort or additional acquisition of technology (Svozilová, 2011).

It is appropriate to propose a set of measurable project items to be checked. For their selection, however, the care should be taken so that the controlled values were reliable and objective, consistent (i.e. comprising a series of coherent data for the assessment of trends), repeatable, understandable and justified in terms of the costs of acquisition (i.e. the costs of their purchase should not exceed the value of the effect that will be brought by the control) (Barker, Cole, 2009).

3.13 Project Closure Process

The project closure is the activity, in which all activities of the project are closed. Project outputs are submitted and approved, project team members are released, and the administration of the project is closed. At this stage, the project is also evaluated (Svozilová, 2011).

Evaluation should be performed immediately after the completion of the project/event. It is important to get the feedback from the client and from the participants of the event as well (techniques of qualitative and quantitative research can be used - a questionnaire with questions like how they liked the program of the event, how they were satisfied with catering and the overall organization of the event, whether they changed an attitude to the brand/company, etc.). Received responses should be discussed with the entire implementation team and it is necessary to seek such solutions to problems and shortcomings so that they could not be again repeated in the future. The resultant response is not important only for future events, but it serves also as a source of reference for potential clients (Barker, Cole, 2009).

Svozilová (2011) adds that along with the implementation team it is also necessary to evaluate whether the project objectives have been achieved, to what extent and how effectively. The performance of each team member or suppliers should also be evaluated. The effectiveness of a promotional campaign needs to be evaluated as well.

The output of the entire evaluation process is then the event assessment report or a report that contains all the facts or activities related to the evaluation phase of the project (incl. completed questionnaires from participants or the client) (Mehndiratta, 2009).

Besides the evaluation phase of the event the approval of outcomes of the project/event by the sponsor and customer of the project, the final invoicing, additional settlement and others are included into the project closure process phase.

3.14 Econometric and Decision-Making Techniques

Econometrics can be defined as *"a set of quantitative techniques that are useful for making economic decisions"* (About Education, 2016).

According to Business Dictionary (2016) the definition of decision-making is: *"The thought process of selecting a logical choice from the available options. When trying to make a good decision, a person must weight the positives and negatives of each option, and consider all the alternatives. For effective decision making, a person must be able to forecast the outcome of each option as well, and based on all these items, determine which option is the best for that particular situation."*

When both are put together, the understanding of the meaning of econometric and decision-making techniques is provided. A lot of decisions taken by managers within companies are based on intuition or previous experience. However, to be really efficient within managerial decisions and to enhance the decision-making process, as well as to ensure that the decision taken is the best possible, a set of techniques dealing with uncertainty and eliminating risks of an inefficient decision-making process exists. And as indicated above, the given techniques are called econometric and decision-making techniques.

These quantitative techniques can help clarify the decision and answer questions such as • Should I invest? • Should we hire more employees? • What price should be fixed for this product? • When are the ideal opening hours? And many more.

About the topicality of given techniques and the importance of the explanation of their correct application within business environment informs a Harvard Business Review article: *"Econometric models will be utilized more extensively in the next five years, with most large companies developing and refining econometric models of their major businesses.* […] *The need today, we believe, is not for better forecasting methods, but for better application of the techniques at hand"* (Chambers, Mullick, Smith, 2016).

In the following subchapters, the examples of techniques mostly used for business purposes will be given in order to demonstrate a new paradigm for management science based on data-intensive computing.

3.12.1 Modeling

• Applying models for the support of decision-making within a business (Winston, 2011)

What is a model?

• A carefully selected reality abstraction (tangible, comprehensible, ease of modification and manipulation, range of use)

– Physical model

• Model of an airplane/house/city

– Analog model

• Road map, speedometer, pie chart

– Symbolic model

• Simulation/algebraic/spreadsheet model

Modeling

• A simplified representation of reality reproducing the behavior of the system studied

• Everything in a model cannot be modeled, i.e., all the variables affecting the target variable cannot be incorporated

• Approximately reproducing the operation of the system studied

The modeling process

- Being explicit about the aims
- Identifying and recording the types of decisions which influence the aims
- Identifying and recording interactions and trade-offs among the decisions
- Thinking carefully about which variables to encompass
- Taking into consideration the pertinence of the data and their interactions
- Recognizing constraints or limitations on the values
- Communications of ideas and comprehension to facilitate teamwork are enabled through models

Decision models

• The analytical power of spreadsheets together with the data storage and computational speed of computers is exploited by means of models

• An explicit performance measure that gauges the attainment of the aim is included into decision models

Typology of variables

- **Outputs**: the ultimate values of interest (the top of the decision tree)
- **Decision variables**: the variables controlled by decision makers (the end of the decision tree)
- **Parameters**: the values represent the environment or the context. They cannot be controlled by decision makers (the end of the decision tree)
- **Intermediate variables**: the variables that connect decision variables and parameters to outputs

  (Čechura, 2013)

Construction of the model

The following five steps determine the building of a model in a spreadsheet:

1) Describing and understanding the managerial situation
2) Building the influence diagram that links various variables
3) Specifying the kinds of variables that reflect aims
4) Determining equations
5) Working on spreadsheets

3.12.2 Simulation

Decision models types (Albright, Winston, Zappe, 2010)

• Deterministic Models – All the input data values are known with the entire certainty

• Probabilistic/Stochastic Models – Some input data values are uncertain

What is simulation?

• Imitation or representation of a potential situation or experimental testing

• The basic concept consists in building an experimental device, or simulator, that will "act like" the system of interest ... in a fast, cost-effective manner

• Simulation is one of the most broadly used decision modeling techniques

Advantages of simulation

- Flexibility
- Dealing with large and complex systems
- Answering "what-if" questions
- Not interfering with the real system
- Studying interactions among variables
- Possibility of "Time compression"
- Managing complications that other methods cannot deal with

Disadvantages of simulation

- Can be expensive and time consuming
- Optimal solutions are not generated
- Managers must select solutions they want to try ("what-if" scenarios)
- Uniqueness of each model

Simulation in business analysis

- Mathematical models usage
- Probabilistic (as opposed to deterministic)
- Uses the complete range of possible variable values in the model
- Imitation of a system or situation (how long a person may have to wait in a line at a restaurant)

Steps of Monte Carlo Simulation

• Step 1: Determining the probability distribution for each random variable

• Step 2: Using random numbers to generate random values

• Step 3: Repetition for a number of replications

Random variables (RVs)

• Random variable value is based on an (uncertain) result of an experiment

• Random variables in a real life where there are uncertainties, such as

– Demand for products

– Lead time for orders

– Time between equipment breakdown

– Service time

– Etc.

Step 1: Determining the probability distribution of each random variable

- Kinds of variables
- There are lots of different probability distributions (e.g. general discrete, normal, Poisson, uniform, exponential, binomial, etc.) – A probability distribution is a table or an equation which links each result of a statistical experiment with its probability of occurrence.
- Usually using historical data for the determination of the best distribution

Kinds of variables in simulation

• Discrete

– Used for the simulation of specific values or specific points: take no more than countable number of values

– Example: Number of people in a queue

• Continuous

– Used for the simulation of any value (between specific points): take any value in the interval

– Example: The amount of time a man spends in a queue

• Discrete – Continuous

– Sometimes it is convenient for a discrete probability distribution to be treated as a continuous, and vice versa

Probability Distributions

• The behavior of a variable is defined by a probability distribution by determining the limits, central tendency and nature of a variable

– Mean; Standard Deviation; Upper and Lower Limits; Continuous or Discrete

• Examples are as follows:

– Uniform (continuous or discrete); Normal Distribution (continuous); Binomial (discrete); Poisson (discrete); Exponential (continuous); Custom (formed to suit a specific aim)

Uniform distribution

- FLAT: all values between minimum and maximum occur with the same probability (both discrete and continuous)
  - Minimum Value is Fixed
  - Maximum Value is Fixed
  - All values occur with the same probability

Normal distribution

- Bell-shaped: used for modeling the probability when any real observation will fall between any two real limits or real numbers, as the curve approaches zero on either side
  - Uncertain variable is symmetric about the mean

– Mostly used but not always the most proper distribution

Normal examples

- Errors in the measurement
- Physical and mental characteristics of people
- Manufactured products properties
- Daily investment revenues

Triangular distribution

• Similar to normal distribution: a continuous probability distribution with a probability density function like a triangle (continuous) can be distorted

– Determined by three values: the minimum a, the maximum b, and the peak c (mode – most likely)

Binomial distribution

- Used for the modeling of the number of successes in a sequence of n independent yes/no experiments (discrete)
  - The experiment is composed of a sequence of n identical trials
  - All possible results can be divided into two categories, usually called success and failure
  - The probability of success, p is constant from a trial to a trial
  - The result of any trial is independent of the result of any other trial

Step 2: Use random numbers to generate random values

• Random numbers occur where all values are equally probable

– Rolling a single die creates random numbers between 1 and 6

– With the use of two-digit random numbers (00 to 99) the probability of each is 1/100 or 0.01

• Random numbers can come from a computer, a table, a roulette wheel, etc.

Step 3: Replication of simulation

• Drawing a random number repeatedly and defining the demand for a given month

• A simulation must be replicated many times to cover the full scope of variability and get meaningful results

Role of a computer in simulation

• Doing everything "by hand"

• Computers are much quicker

• Built-in procedures for a variety of probability distributions are encompassed into software packages

• Replications are observed

Evaluating results

• A simulation measures the quality of a solution as it provides the probability of a particular event which occurs

• The variability is shown by a simulation

• A simulation may not give the best possible reply. It gives the most probable reply.

What is Monte Carlo simulation?

Monte Carlo simulation is a computerized mathematical technique that enables to resolve the risk in a quantitative analysis and decision making. The technique is used by specialists in such widely different fields as finance, project management, manufacturing, engineering, research and development, insurance, transportation, the environment etc. (Albright, Winston, Zappe, 2010)

3.12.3 Forecasting

Time series and forecasting (Hoshmand, 2010)

- "Forecasting is an endeavor to foresee the future by examining the past" (Panda, 2009).
- Time series methods: The past data are constrained to past values of the variable. All sorts and forms of forecasting techniques are extrapolation, i.e., envisaging within the current data.
- It is significant for quantitative forecasting techniques to be used together with the analysis, judgment, common sense, and business experience so that to produce an effective forecasting result.

Forecast process

- Problem definition
  - Aims specification
  - Defining of what to forecast
- Gathering information
  - Time dimensions identification
  - Data consideration
- Selecting and fitting models
  - Model selection
  - Model devaluation
- Using and assessing a forecasting model
  - Forecast preparation and presentation
  - Tracking outcomes

Decomposition forecast

- As the time series decomposition models do not encompass lots of mathematics or statistics, they can be relatively easily explained to the end user.
- That is a main advantage as if the end user knows how the forecast was developed, he or she may have more confidence in its use for decision-making.

Classical decomposition models

• Additive or Multiplicative decomposition

– Step 1: A centered MA of order k is calculated

– Step 2: Seasonal factors are determined

– Step 3: Seasonal indices are established

– Step 4: Long-term trend is estimated

– Step 5: The fitted value is calculated

– Step 6: Irregular component is found

– Step 7: Forecast accuracy is measured

– Step 8: Forecasting

(Hoshmand, 2010)

Terms and symbols

• CMA: centered moving average

• SF: seasonal factor

• SI: seasonal indices

• Y: actual value

• Y*: deseasonalized value

• T: trend

• $\hat{Y}$ (Y-hat): fitted value

• E: irregular (random) component

Introduction to Time Series Analysis & Forecasting

- Forecasting future values of the series
- Conducting exploratory time series analysis with the use of plots and decomposition techniques

Classical decomposition models

Introduction

- One of the approaches to the time series data analysis is based on sleeking historical data in order to split off the given pattern in the data series from randomness
- It is possible to project the given pattern into the future and subsequently use it as the forecast

Decomposition

- The given pattern can be smashed down into sub-patterns for the identification of the component factors which affect each of given values
- This process is called decomposition
- It tries to detect two independent components of the elementary underlying pattern which describes economic and business series
  – Trend
  – Seasonality
  – Cycles (NOT CONSIDERED, as it is often difficult to determine)

Components

- Long term changes in a series level are represented by the Trend.
- The Seasonal factor means the periodic fluctuations of a persistent length which is habitually caused by the following factors: rainfall, month of the year, timing of the holidays, etc.
- The decomposition model supposes that the data have the form as follows:

Data = Pattern + Error

$= f$ (Trend, Seasonality, error)

Decomposition model

• Mathematical exemplification of a decomposition approach is the following:

$Y_t = f(S_t, T_t, E_t)$

– Y_t is the time series value (genuine data) at period t.

– S_t is the seasonal component (index) at period t.

– T_t is the trend component at period t.

– E_t is the irregular (remainder) component at period t.

Functional form

• The precise functional form is determined by the decomposition model used. Two current approaches are as follows:

• Additive Model $Y_t = S_t + T_t + E_t$

• Multiplicative Model $Y_t = S_t \times T_t + E_t$

Additive model

- An additive model is proper if the magnitude of the seasonal fluctuation does not show a discrepancy with the series level.

Multiplicative model

- A multiplicative model prevails more with economic series as most of them have seasonal variation that rises with the series level.

  (Hoshmand, 2010)

Step 1: Deseasonalizing

• Removing short-term fluctuations from the data so that a long-term component (trend) could be undoubtedly determined

- Short-term fluctuations comprise seasonal patterns and irregular components as well
- Short-term fluctuations can be removed by working out a pertinent moving average (MA) for the series

Step 1: Deseasonalizing

• The moving average should encompass the equal amount of periods as there are in the seasonality which is being determined

– For determining monthly pattern MA(12) is used

– For determining quarterly pattern MA(4) is used

• The moving average is a "typical" level of Y for the year which is centered on the moving average

Centered Moving Average 1

- The traditional usage of the term moving average is that at each point in time we define (possibly weighted) averages of investigated values which frame a particular time.
- For example, at time t, a "centered moving average of length 3" with the identical weights would be the average of values at times t -1, t, and t+1.
- It is more difficult if t is an even number (quarterly or monthly): where is the center?

Centered Moving Average 2

• At time t, a "centered moving average of length 4' with the same weights is computed as below:

– Average of values at t-2, t-1, t, and t+1 [1]

– Average of values at t-1, t, t+1, and t+2 [2]

– Take the average of [1] and [2] → [3]

$$t = \frac{1}{8}x_{t-2} + \frac{1}{4}x_{t-1} + \frac{1}{4}x_t + \frac{1}{4}x_{t+1} + \frac{1}{8}x_{t+2}$$

Centered Moving Average 3

• To smooth away seasonality in monthly data, in order to identify trend, the usual convention is to use the moving average smoothed at time

$$t = \frac{1}{24}x_{t-6} + \frac{1}{12}x_{t-5} + \frac{1}{12}x_{t-4} + \cdots + \frac{1}{12}x_{t+4} + \frac{1}{12}x_{t+5} + \frac{1}{24}x_{t+6}$$

So, in general

• Centered moving average is

$$CMA_t = \frac{\frac{1}{2}Y_{t-L/2} + Y_{t-L/2+1} + \cdots + Y_t + \cdots + Y_{t+L/2-1} + \frac{1}{2}Y_{t+L/2}}{L}$$

- where L = Number of seasons within a year (L = 2 for 1⁄2-year data, 4 for quarterly data, and 12 for monthly data)
- L values will be lost from the sample

Step 2: Measuring Seasonal Factor

• The centered moving average represents the deseasonalized data

• The degree of seasonality, called seasonal factor (SF), is the ratio of the actual value to the deseasonalized value. That is

– For additive models $SF_t = Y_t - CMA_t$

– For multiplicative models $SF_t = \frac{Yt}{CMAt}$

Step 3: Establishing average Seasonal Index

• Seasonal indices (SI) are computed as follows:

– Seasonal factors for each of the four quarters (or 12 months) are summed and divided by the quantity of observations to attain the average seasonal factors (ASF) for every quarter (or month).

– The sum of the average seasonal factors should be the same as the amount of periods (4 for quarters and 12 for months).

– If not, average seasonal factors should be standardized by multiplying each by the ratio of the amount of periods to the sum of the average seasonal factors.

Step 4: Estimating long-term trend

- The long term movements or trends in a series can be described by a straight line or a smooth curve.
- The long-term trend is assessed from the deseasonalized data for the variable to be predict.

• Deseasonalized data are

– For additive models $Y_t^* = Y_t - SI$

– For multiplicative models $Y_t^* = \frac{Yt}{SI}$

• To find the long-term trend, we estimate a simple linear equation as

$Y_t^* = f(\text{Time})$

$Yt^* = a + b\ (\text{Time})$

– Where Time =1 for the first period in the data set and amplified by 1 each quarter (or month) thereafter.

– The method of the smallest squares can be used for the assessment of a and b.

• Once the trend parameters are defined, they are used to produce the trend value estimate of the centered moving average for the past and forecast periods.

Step 5: Computing the fitted value

• For additive models $\hat{Y}_t = SI + Trend$

• For multiplicative models $\hat{Y}_t = SI * Trend$

Step 6: Finding irregular component

• Irregular (random) component $E_t = Y_t - \hat{Y}_t$

Step 7: Measuring forecast precision

• Emphasizing RMSE and defining which is the best (better) model

Step 8: Forecasting

(Hoshmand, 2010)

Seasonal adjustment

- A suitable by-product of decomposition brings an easy way to compute seasonally accustomed data.
- For additive decomposition, the seasonally accustomed data are computed by subtracting the seasonal component. $Y_t - S_t = T_t + E_t$
- For multiplicative decomposition, the seasonally adjusted data are computed by dividing the original observation by the seasonal component. $\frac{Yt}{St} = T_t$
- Most published economic series are seasonally accustomed as the seasonal variation is habitually not of primary interest.

Deseasonalizing the data

• The outcomes of the deseasonalizing data process are positive:

– The underlying pattern in the data is seen in a better way.

– Measures of the extent of seasonality in the form of seasonal indexes are provided.

– The instrument in projecting what one quarterly (or monthly) observation might foretell for the whole year is also provided.

Finding Seasonal Indexes

• In general:

- Seasonal accommodation enables trustworthy comparison of values at diverse points in time.
- It is easier to comprehend the relationship among economic or business variables as soon as the seasonality factor has been removed from the data.
- Seasonal accommodation might be useful in the production of short term forecasts of a time series future values.

Stationarity

Investigating stationarity of time series (Winston, 2011)

- The characteristics of a stationary time series do not depend on the time at which the series is examined.

– Stationarity means no rise or fall, i.e., no trend

– Stationarity means no seasonality

- Data oscillate around a stable mean independent of time, and the fluctuation variance stays stable over time

Time series plot and stationarity

• Stationarity is possible to be estimated with the use of a time series plot

– Plot indicates no change in the mean over time

– No clear change in the variance over time

• Time plots will display the series to be roughly horizontal (there may be some cyclic behavior) with stable variance.

Smoothing models

One of the approaches to the analysis of time series data is focused on smoothing previous data in order to separate the given pattern in the data series from randomness. (Winston, 2011)

- Given models are appropriate for times series data with a seasonal or trend component, or both components and stationary data
- The classification of forecasting methods can be as follows:

– Averaging methods

– Exponential smoothing methods

Averaging models

Averaging models

• The models count on the supposition that the data are stationary (neither trend nor seasonality in the time series)

– In case a time series is created by a stable procedure subject to random error, then the mean is a suitable statistic and it is possible to use it as a forecast for the following period.

– Averaging models are proper for stationary time series data where the series is in balance around a stable value (the underlying mean) with a stable variance over time.

Simple moving average

• The observations used in the calculation are weighted in the same way

$$MA_q = \frac{\sum_{i=1}^{q} Yi}{q}$$

where

q = number of periods utilized in the moving average

Y_i = observation at the period *i*

How to choose the span q?

- Minor values of q cause light smoothing; forecast series thoroughly reflects original series

– Appropriate when there exist unexpected shifts in the series

- Huge values of q cause substantial smoothing; forecasting series tracks general elementary movement. It could cause misleading forecast if series fluctuations are the part of the pattern and not random

– Appropriate when there exist extensive, rare fluctuations in the series

- Using MAE, RMSE, and MAPE, to choose q which yields smaller values of error metrics

Simple Moving averages

- For quarterly data, a four-quarter moving average, MA(4), removes or averages out seasonal effects.
- For monthly data, a 12-month moving average, MA(12), removes or averages out seasonal effect.
- Identical weights are allocated to each observation that is utilized in the average.
- Each new data point is encompassed in the average as it becomes disposable, and the oldest data point is eliminated.
- The moving average model does not handle trend or seasonality very well though it could do better than the whole mean.

Weighted moving average

• The latest observations are classically given more weight than previous observations

$WMA_q = \sum_{i=1}^{n} W_{t-i} Y_{t-i}$

where

W_{t-i} = the weight for the period t-*i*, between 0 and 1

$\sum W_{t-i} = 1$

(Winston, 2011)

Exponential smoothing models

• The method gives an exponentially weighted moving average of all formerly observed values. (Winston, Albright, 2011)
• Proper for data with no predictable upward or downward trend.
• The objective is to assess the contemporary level and utilize it as a forecast of the forthcoming value.

Simple exponential smoothing

• The model counts on the supposition that the data are stationary (neither trend nor seasonality in the time series)

$F_{t+1} = \alpha Y_t + (1 - \alpha) F_t$

where:

F_{t+1} = forecast for the following period

Y_t = real observation for a current period

F_t = previously defined forecast for a current period

α = smoothing parameter

The forecast F_{t+1} is established on weighting the latest observation Y_t with a weight α and weighting the latest forecast F_t with a weight of 1- α

Simple exponential smoothing

• Provided the former equation is extended by replacing F_t with its components, exponential smoothing implication may be better seen:

$$F_{t+1} = \alpha Y_t + (1 - \alpha) F_t$$
$$= \alpha Y_t + (1 - \alpha) [\alpha Y_{t-1} + (1 - \alpha) F_{t-1}]$$
$$= \alpha Y_t + \alpha (1 - \alpha) Y_{t-1} + (1 - \alpha)^2 F_{t-1}$$

Simple exponential smoothing

• If the substitution process is replicated by replacing F_{t-1} by its components, F_{t-2} by its components, and so on the outcome is as follows:

$$F_{t+1} = \alpha Y_t + \alpha (1 - \alpha) Y_{t-1} + \alpha (1 - \alpha)^2 Y_{t-2} + \alpha (1 - \alpha)^3 Y_{t-3} + ... + \alpha (1 - \alpha)^{t-1} Y_1$$

• Hence, F_{t+1} is the weighted moving average of all previous observations.

Simple exponential smoothing

• The role of weighting factor α is clarified by the exponential smoothing equation that is rewritten in the following form:

$$F_{t+1} = F_t + \alpha (Y_t - F_t)$$

• Exponential smoothing forecast is an old forecast plus an accommodation for the error that arose in the previous forecast.

Simple exponential smoothing

- The value of smoothing constant α has to be between 0 and 1.
- α cannot be identical with 0 or 1.
- A slight value of α is appropriate if constant predictions with smoothed random variation are preferred.
- A huge value of α is proper on the condition that a quick reaction to a real change in the pattern of observations is wanted.

Simple exponential smoothing

- To assess α, Forecasts are calculated for α equal to .1, .2, .3, ..., .9 and the total of squared forecast error is calculated for each.

- The value of α with the smallest RMSE is selected for the usage in generating future forecasts.

Simple exponential smoothing

• To commence the algorithm, F_1 is necessary because

$F_2 = \alpha Y_1 + (1 - \alpha) F_1$

• As F1 is unknown

–The first estimate identical with the first observation can be set

– The average of the first five or six observations for the initial smoothed value can be used

(Winston, Albright, 2011)

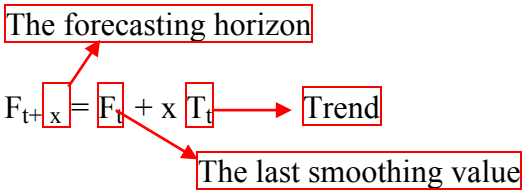
Holt's exponential smoothing

Holt's exponential smoothing

- Holt's two parameter exponential smoothing method is an expansion of simple exponential smoothing.
- It supplements a rise factor (or trend factor) to the smoothing equation as a way of accommodating for the trend.

Holt's exponential smoothing model

• There exist a trend but no seasonality in the time series



where

- $F_t = \alpha Y_t + (1 - \alpha)(F_{t-1} + T_{t-1})$
- $T_t = \beta (F_t - F_{t-1}) + (1 - \beta) T_{t-1}$
- α and β are smoothing parameters (between 0 and 1)

Holt's exponential smoothing model

– F_t = estimate of the level of the series at time t

– α = smoothing constant for the data

– Y_t = new observation or real value of series in period t

– β = smoothing constant for trend assessment

– T_t = estimation of the slope of the series at time t

– x = periods to be forecast into the future.

Holt's exponential smoothing model

- The weight α and β can be chosen subjectively or by minimizing a forecast error measure such as RMSE.
- Higher weights result in more speedy changes in the component.
- The result of smaller weights in less speedy changes.

Holt's exponential smoothing model

• The initialization process for Holt's linear exponential smoothing needs two assessments:

– One to acquire the first smoothed value for F_1

– The other to acquire the trend T_1.

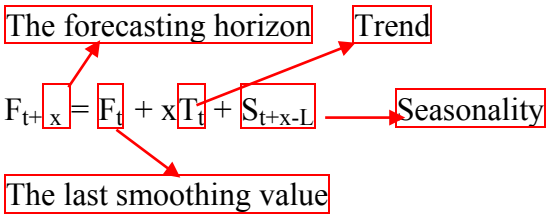
• One of the alternatives is to set $F_1 = Y_1$ and $T_1 = 0$

Holt-Winters' exponential smoothing

Holt-Winters' exponential smoothing

- Holt-Winters' exponential smoothing method is an expansion of the Holt's method of smoothing
- Winters' exponential smoothing model is the second expansion of the elementary Exponential smoothing model.
- Convenient for data which exhibit the trend and seasonality as well.
- It is a three parameter model which is Holt's method expansion.
- It is possible for the seasonal component in Holt-Winters' method to be multiplicative and additive as well.
- An additional equation accommodates the model for the seasonal component: the additive model or the multiplicative model can be utilized for classical decomposition.

Holt-Winters' additive model



where

$F_t = \alpha (Y_t - S_{t-L}) + (1 - \alpha) (F_{t-1} + T_{t-1})$

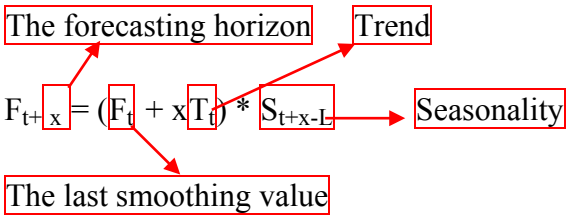
$T_t = \beta (F_t - F_{t-1}) + (1 - \beta) T_{t-1}$

$S_t = \gamma (Y_t - F_t) + (1 - \gamma) S_{t-L}$

α, β and γ = smoothing parameters (between 0 and 1)

L = number of seasons in a year (L = 12 for monthly data, and L = 4 for quarterly data)

Holt-Winters' multiplicative model



where

$F_t = \alpha Y_t / S_{t-L} + (1 - \alpha)(F_{t-1} + T_{t-1})$

$T_t = \beta (F_t - F_{t-1}) + (1 - \beta) T_{t-1}$

$S_t = \gamma Y_t / F_t + (1 - \gamma) S_{t-L}$

α, β and γ = smoothing parameters (between 0 and 1)

L = number of seasons in a year (L = 12 for monthly data, and L = 4 for quarterly data)

Holt-Winters' exponential smoothing

– Forecast x period into the future:

- F_t = level of series
- α = smoothing constant for the data
- Y_t = new observation or real value in period t
- β = smoothing constant for trend assessment
- T_t = trend estimation
- γ = smoothing constant for seasonality assessment
- S_t = seasonal component estimation
- x = number of periods in the forecast lead period
- L = length of seasonality (number of periods in the season)
- F_{t+x} = forecast for x periods into the future

Holt-Winter's exponential smoothing

- Regarding Holt's linear exponential smoothing, the weights α, β and γ can be chosen subjectively or by minimizing forecast error measure such as RMSE.
- As for all exponential smoothing methods, initial values for the components are needed to commence the algorithm.
- To commence the algorithm, the initial values for F_t, the trend T_t, and the indices S_t have to be set.

Holt-Winter's exponential smoothing

• At least one complete season's data (i.e. s periods) must be used to define initial estimations of the seasonal indices. Thus, the trend and the level at period s are initialized.

- Commence level: $F_s = \frac{1}{s}(Y_1 + Y_2 + \ldots + Y_s)$
- Commence trend: $T_s = \frac{1}{s}\left(\frac{Y_{s+1} - Y_1}{s} + \frac{Y_{s+2} - Y_2}{s} + \ldots + \frac{Y_{s+s} - Y_s}{s}\right)$
- Commence seasonal indices:
  - for additive models: $S_1 = Y_1 - F_s$, $S_2 = Y_2 - F_s$, …, $S_s = Y_s - F_s$
  - for multiplicative models: $S_1 = \frac{Y_1}{Fs}$, $S_2 = \frac{Y_2}{Fs}$, ⋯, $S_s = \frac{Y_s}{Fs}$

Holt-Winter's exponential smoothing

- The smoothing constant α smoothes the data to remove randomness.
- The smoothing constant β smoothes the trend in the data set.
- The smoothing constant γ smoothes the seasonality in the data.
- The first values for the smoothed series Ft, the trend Tt, and the seasonal index St must be set.

(Winston, Albright, 2011)

Table No. 3: Overview of Methods for Forecasting

	Components	
Model	Trend	Seasonality
Classical Decomposition (Additive+Multiplicative)	x	x
Simple Moving Average		
Weighted Moving Average		
Simple Exponential Smoothing		
Holt	x	
Holt-Winters (Additive+ Multiplicative)	x	x

Source: Own processing

Smoothing models

- Calculation manually and with XLSTAT
- Moving averaging
  – Simple moving average (stationary)
  – Weighted moving average (stationary)
- • Exponential
  – Simple exponential smoothing (stationary)
  – Holt's exponential smoothing (stationary + trend)
  – Holt-Winters' seasonal exponential smoothing (stationary + trend + seasonality)

4 PRACTICAL PART

The given chapter provides an overview of ŠKODA AUTO a.s. with the focus on Marketing Communications department, deals with the identification of the project management of events within Marketing Communications department and provides practical examples of using econometric and decision-making techniques for the preparation of events tailored for ŠKODA AUTO a.s.

4.1 Company Profile

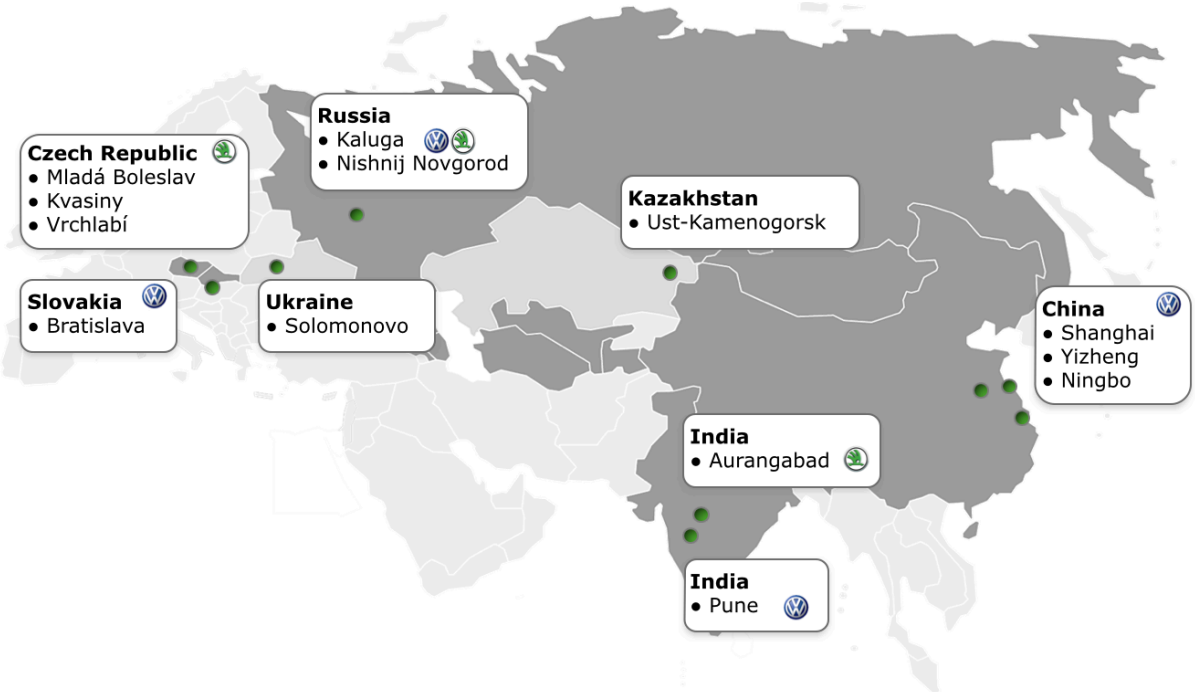
The company ŠKODA AUTO a.s. (hereinafter referred to as "ŠKODA AUTO") with headquarters in Mladá Boleslav in the Czech Republic belongs to one of the longest-operating automobile manufacturers worldwide. ŠKODA AUTO business activities are primarily the development, production and sale of ŠKODA cars, as well as its components, accessories and original parts, along with providing services to customers.

The history of the company dates back to 1895, when Václav Laurin and Václav Klement laid the foundation for over 100 years of the tradition and Czech expertise in automotive industry by initially launching bicycle, and shortly thereafter motorcycle and car production. ŠKODA AUTO itself was incorporated as a joint-stock company on 20 November 1990. The ŠKODA brand has been a Volkswagen Group brand for more than 20 years. During this period of successful cooperation its sales have more than tripled and its product portfolio has remarkably expanded.

ŠKODA AUTO is identified as one of the leading companies in the Czech Republic. It consists of the parent company ŠKODA AUTO a.s., its fully consolidated subsidiaries ŠKODA AUTO Deutschland GmbH, ŠKODA AUTO Slovensko, s.r.o., Skoda Auto India Private Ltd., and associates. The sole shareholder of ŠKODA AUTO is VOLKSWAGEN FINANCE LUXEMBURG S.A. with its registered office in Luxembourg City, the Grand Duchy of Luxembourg, which is the subsidiary of VOLKSWAGEN AG with its headquarters in Wolfsburg, the Federal Republic of Germany. ŠKODA AUTO is registered in the Commercial Register maintained with the Municipal Court in Prague, Section B, Insert 332, with File No. Rg. B 332.

ŠKODA AUTO with its growing international presence has nowadays more than 25,800 employees globally and actively operates in more than 100 markets on 5 continents. ŠKODA AUTO has 3 production plants in the Czech Republic along with manufacturing facilities in India, China, Russia and the Slovak Republic. Moreover, ŠKODA cars are produced in Kazakhstan and the Ukraine through local partners as well). In 2014, ŠKODA AUTO sales revenue increased year-on-year by 22.9 % to CZK 299.3 billion making it the highest result in the company's history. ŠKODA AUTO can be described as a strong brand producing impressive automobiles, having a motivated and capable team and the ability to turn innovations into "Simply Clever" solutions.

Figure No. 1: Production Network



Source: ŠKODA AUTO (2016)

4.1.1 Strategy and Vision of the Company

New cars are developed according to ŠKODA AUTO customers wishes in order to offer an attractive design, a number of technical innovations at an excellent price-performance ratio and simple functional features in keeping the principle "Simply Clever".

Social policy

The philosophy of the policy of ŠKODA AUTO in the personnel and social area is based on a long-term role of the largest employer in the region, puts a human being into the center of attention and emphasizes corporate social responsibility towards both employees and the surrounding area.

Economic area

The company ŠKODA AUTO has, as one of the largest and most important Czech companies, a unique position within the economy of the Czech Republic.

Environment

ŠKODA AUTO is aware of its responsibility for a friendly approach to the environment. With its activities ŠKODA AUTO contributes to the sustainable development.

Seven core values of corporate culture ŠKODA AUTO

- Sustainable Development
- Innovation
- Creation of Value
- Responsibility
- Responsiveness to Customers
- Maximum Performance
- Respect

Company mission

In everything ŠKODA AUTO does, its goal is the quality:

- Quality of Products
- Quality of Services
- Quality of Collaborators
- Quality of Financial Results

4.1.2 Company Bodies

The General Meeting is not held at ŠKODA AUTO, its powers are executed by the sole shareholder. As previously mentioned, the sole shareholder is the company VOLKSWAGEN FINANCE LUXEMBOURG S.A.

The company bodies consist of the Board of Management, the Supervisory Board and the Audit Committee. The members of the Board of Management are listed below.

Board of Management

- Bernhard Maier (*1959)

Chief Executive Officer of ŠKODA AUTO

- Werner Eichhorn (*1963)

Member of the Board of Management for Sales and Marketing

- Dipl.-Kfm. Winfried Krause (*1962)

Member of the Board of Management for Commercial Affairs

- Dipl.-Ing. Michael Oeljeklaus (*1963)

Member of the Board of Management for Production and Logistics
Russia representative of the Board

- Dipl.-Ing. Dieter Seemann (*1957)

Member of the Board of Management for Purchasing

- Christian Strube (*1963)

Member of the Board of Management for Technical Development

- Ing. Bohdan Wojnar (*1960)

Member of the Board of Management for Human Resources Management

4.1.3 Profiles of Areas of Expertise

In terms of an organizational structure, ŠKODA AUTO is divided into 7 areas of expertise:

Central Management Department

The department ensures the quality requirements of customers for products. Other tasks include strategic product planning, active communicating with the media and professional public, as well as organizing meetings of senior management teams.

Commercial Affairs

Commercial Affairs department plans and manages effective use of financial resources. It is also tasked with securing information and systems for the management needs of the company and to secure timely and economically advantageous deliveries.

Production and Logistics

The department of Production and Logistics is responsible for the production of cars, spare parts, engines and components thereof, as well as logistical activities and preparations for production.

Sales and Marketing

Sales and Marketing department ensures the sales of new and used cars, spare parts and accessories, provides after-sales service on all its sales markets, including determining the competitive position of the individual model series.

Human Resources Management

Human Resources Management department provides services in the areas of personnel, ensures optimal skills, motivation and satisfaction of all employees. Its task is also to communicate with stakeholders.

Technical Development

The department of Technical Development is responsible for new products development, design, construction, testing, caring for vehicles in production and continuous improvement of all products of the ŠKODA brand.

Purchasing

Purchasing department buys production and overhead material, services and investment units for the needs of ŠKODA AUTO.

4.2 Marketing Communications Department

Marketing Communications department belongs under the department of **Sales and Marketing (P)**.

Marketing Communications (PMK) department is responsible for the creation and implementation of communications strategy and events for ŠKODA brand and single model series. The aim is to create and expand ŠKODA brand awareness and image among its present customers and potential customers as well, and to support the sale of its products by proper forms of marketing communications.

Scope of activities:

- International and national advertising and communications campaigns
- Sales literature
- Fairs, exhibitions, events
- Sponsoring activities
- Promotional items
- Support of importers with marketing / marketing communications topics
- Cooperation with agencies

Marketing Communications department is divided into PMK/1 – Online Marketing, PMK/2 – Promotional Items, PMK/3 – International Advertising and Sales Literature, and finally PMK2 – Exhibitions and Events.

Online Marketing (PMK/1) section is responsible for the development, implementation and expansion of global digital marketing communications in the fields such as web platforms, mobile platforms, social media and digital campaign communications for single model series of ŠKODA brand.

Promotional Items (PMK/2) section is responsible for the assortment of promotional items and their international sale to importers and dealers. Promotional items are the part of marketing communications of ŠKODA brand. The part of a portfolio of

promotional items are also so-called launch collections which are prepared by Promotional Items section at the time of launching a new car on the market. The goods are harmonized with a communication color of the car, labeled with the name of the new model and intended particularly for attracting a new target group and increasing awareness about the new car at the time of its presentation.

International Advertising and Sales Literature (PMK/3) section is responsible for the creation and launching of communications campaigns for all models of ŠKODA brand. It focuses on the production of materials for traditional media – Television, Press, Out of Home (OOH) and Point of Sale (POS).

Exhibitions and Events (PMK2) section is responsible for the presentation of ŠKODA brand at international motor shows, for sport sponsoring and international events of ŠKODA AUTO company as well as for the organization of strategic events for ŠKODA AUTO importers, dealers and internal guests, including the top management of Sales and Marketing department.

Fairs and Events section is further divided into PMK2/1 – Fairs and Exhibitions, PMK2/2 – External Events and PMK2/3 – Internal Events.

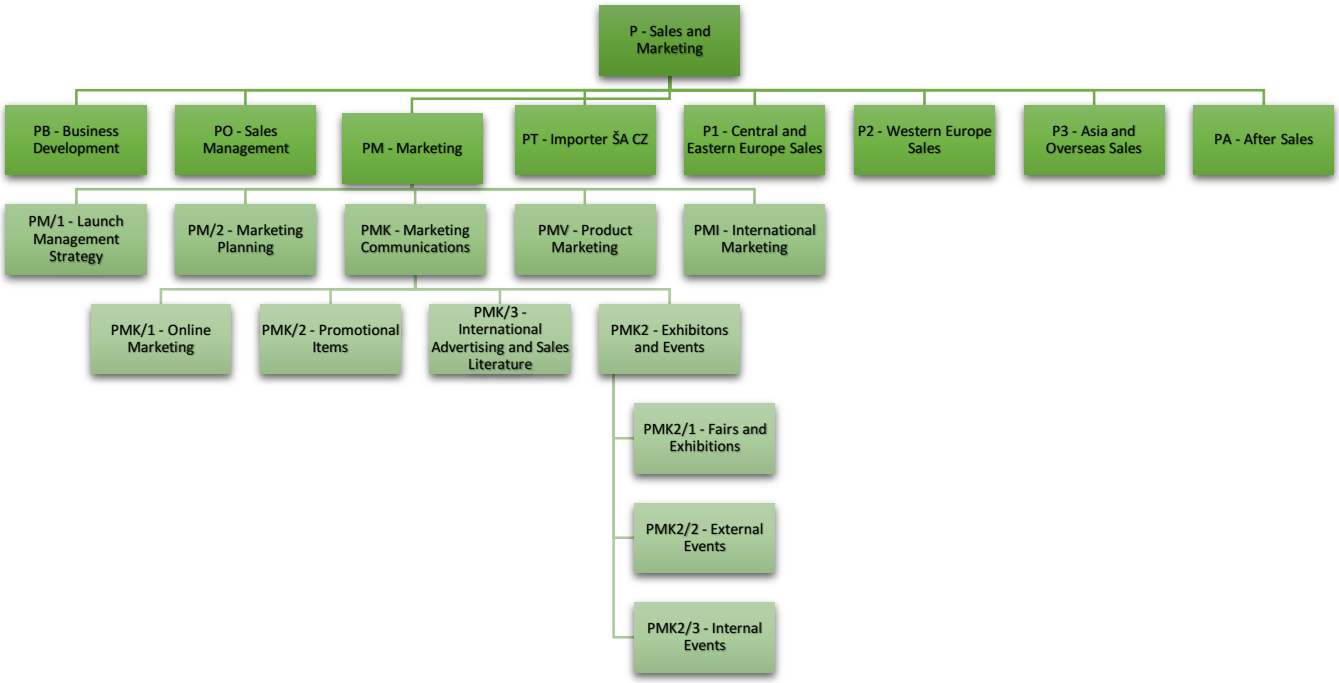
Fairs and Exhibitions (PMK2/1) section is responsible for the presentation of ŠKODA brand at international motor shows. The main task is the planning and presentation of ŠKODA brand at the motor shows of the type A and B such as Geneva, Frankfurt, Paris and Moscow. The whole range of competences includes architectural planning and stand operation, selection of the staff and suppliers, specification of displayed cars, budget supervision and the development of activation concept. Fairs and Exhibitions section team also coordinates car exhibitions at the places such as Prague airport, Autostadt Wolfsburg, Lindecorso Berlin. Moreover, team members hold the positions of consultants for importers organizing exhibitions of a local character of the type B and C.

External Events (PMK2/2) section is responsible for sport sponsoring and international events of ŠKODA AUTO company. In relation to sport sponsoring, External

Events section devises and organizes the presence of ŠKODA brand at international sport events (e.g. Tour de France and IIHF Ice Hockey World Championship). Moreover, the section is responsible for a worldwide sponsoring strategy of the brand in the sport of cycling and ice hockey, i.e., strategic focus, activation, control and evaluation of all sport sponsoring activities of ŠKODA brand importers. The responsibility of the section for events ranges from planning through conception to the implementation and evaluation of international events successfulness (e.g. ŠKODA World Dealer Conference and Wörthersee Treffen).

Internal Events (PMK2/3) section is responsible for organizing strategic events for ŠKODA AUTO importers, dealers and internal guests, including the top management of Sales and Marketing department. Internal Events section is in charge of organizing and implementing events which with their level correspond to the brand and its values. The section organizes both internal events such as P-Klausur, Product Day, Importer of the Year, workshops, and also events that are held abroad such as Best Dealer Event, NSC and MD Meetings etc.

Figure No. 2: Organizational Structure of Marketing Communications Department



Source: Own processing (2016)

4.2.1 Project Management of Events within Marketing Communications Department

Press days: 1 March – 2 March 2016

Days for public: 3 March – 13 March 2016

Motor show grounds:

Palexpo

Route Francois-Peyrot 30

1218 Le Grand-Saconnex

Geneva, Switzerland

Showed ŠKODA cars

1 March 2016 – 7 + concept car Vision S (Superb Sportline, Octavia Combi RS, Fabia MC, Octavia Combi Scout, Fabia Combi Scoutline, Rapid Spaceback Scoutline, Superb Combi L&K)

2 March – 13 March 2016 – 12 + concept car Vision S (Superb Sportline, Octavia Combi RS, Fabia MC, Octavia Combi Scout, Superb Combi L&K), Octavia G-TEC, Models Joy: Rapid Spaceback, Fabia Combi, Yeti

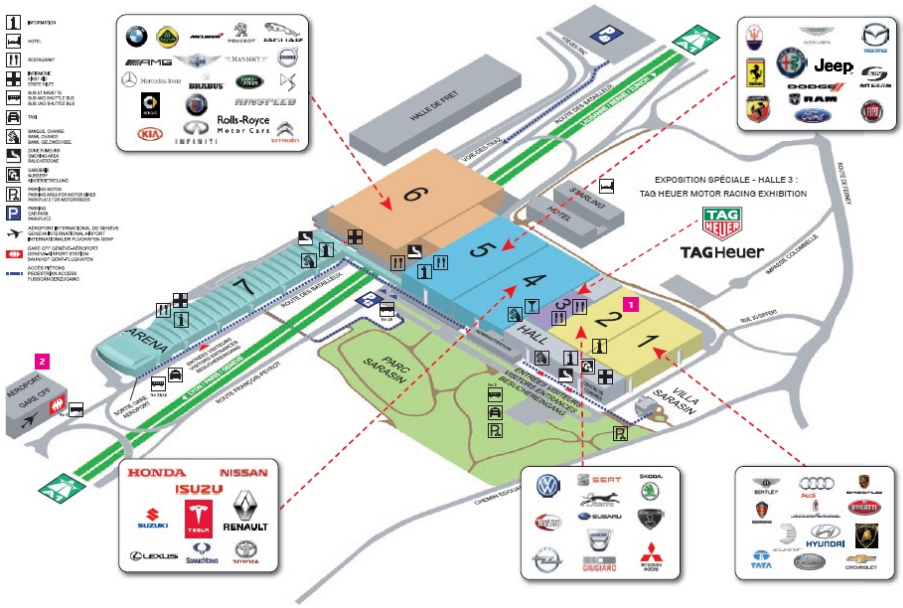
Outdoor, Models MC: Citigo, Rapid Spaceback, Yeti

Placement at motor show grounds

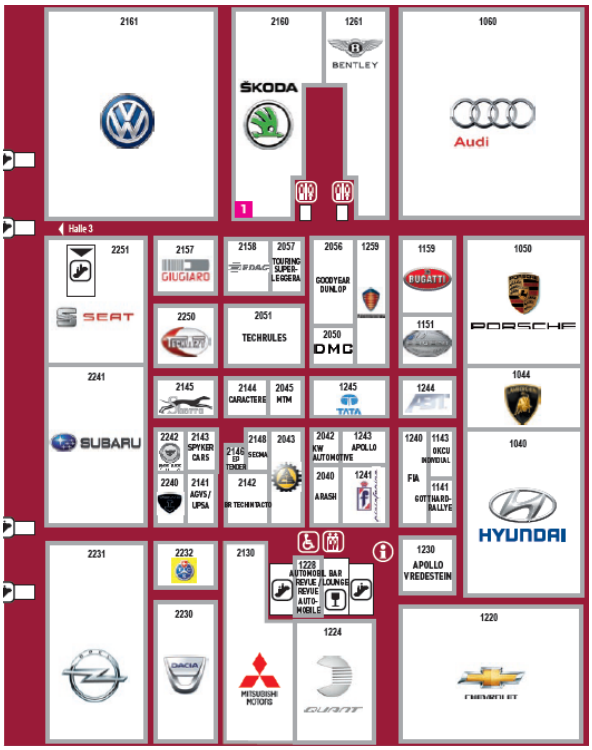
ŠKODA stand: hall 2, stand 2160

Dimensions of the stand: 1,265 m² + 810 m² (1st floor)

Outdoor stand at the airport: Gare CFF Aeroport, Z5



Placement in the hall 2



Responsibilities determination

- Preparation of the exhibition takes place in cooperation with a specialized agency that has been tendered for several years ahead (nowadays it is a German agency). Standbuilding company and the companies supplying the AVL are tendered in the same way. Other suppliers are tendered continuously (media, graphics, etc.).

- All the material for the construction of the stand is also purchased for several years ahead, it is continuously repurchased, repaired and restored.

- 3 parties, which work closely together in order that the total communications at the stand would be integrated (importer in the given country, press department, Experience marketing department), are involved into the preparation and implementation of the construction.

- All interested parties use specialized agencies for implementing concrete activities.

Importer - AMAG

- Reservation of motor show area
- Communications with motor show grounds, particularly ordering services (electricity, IT, tickets, parking, outdoor offices, storage areas, advertising spaces)
- Ordering staff (hostesses, cleaning, clothing)
- Catering for the days for public
- Technical background, market research
- Checking information about exhibition cars
- Ensuring catalogs

Press department

- Creation of the total content of a press conference
- Creation of the content for the LED during a press conference
- Caring for journalists and VIP
- Ensuring catering

Experience Marketing

- Selection of showed cars together with specialized sections (design, regions)
- Planning and the stand construction, including facilities
- Planning and ensuring IT services, electricity etc.
- Communications strategy creation
- Graphics creation
- Creation of the content for the LED
- Staff selection and clothing
- Ensuring promotional catalogs, the content of POI
- Organizational background for ŠKODA AUTO including ticket distribution

Rough timing

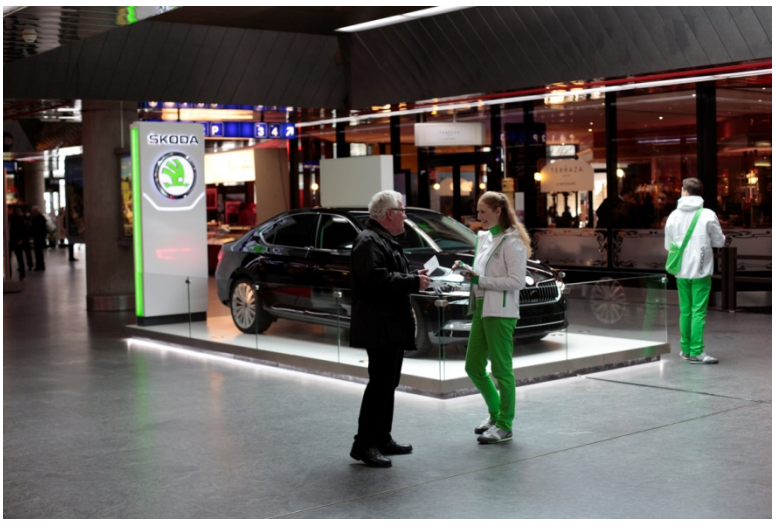
March 2015 – inquiring and ensuring hotel/accommodation for ŠKODA AUTO through AMEX
August 2015 – kick off meeting with the agency, press department and importer
September 2015 – project preparation and planning
Říjen 2015 – presentation for the Board of Directors and internal approving (architecture, exhibition cars, budgets)
October 2015 – project preparation
October 2015 – selection procedure for suppliers of other services (models, IT, etc.)
October 2015 – December 2015 – production of motor show cars in A-exhibition quality
November 2015 – February 2016 – project preparation
December 2015 – presentation for the Board of Directors and internal approving (communication concept)
December 2015 – selection procedure for the supplier of a graphic designer, media
February 2016 – stand construction
29 February 2016 – internal taking over of the stand by the Board of Directors of ŠKODA AUTO
29 February 2016 – Group evening
1 March – 2 March 2016 – press days
3 March – 13 March 2016 – days for public
March – August 2016 – invoicing

During the show, the survey among visitors of the motor show takes place, on the basis of which the results of single stands of VW Group brands and among brands are evaluated. The results of GENF 2016 have not been available yet, ŠKODA usually holds the major position among other VW brands.

ŠKODA communications – Outdoor

- Showed model: ŠKODA Superb Black Crystal
- Video installation: elements production for Superb Black Crystal

- Promotion: hostesses wearing ŠKODA brand clothes providing vouchers in order to attract visitors for the ŠKODA stand. Visitors get sun glasses against the voucher, and they are offered registration for so-called "Customer journey".



ŠKODA communications – stand

Highlight cars

Vision S

Superb Combi Sportline

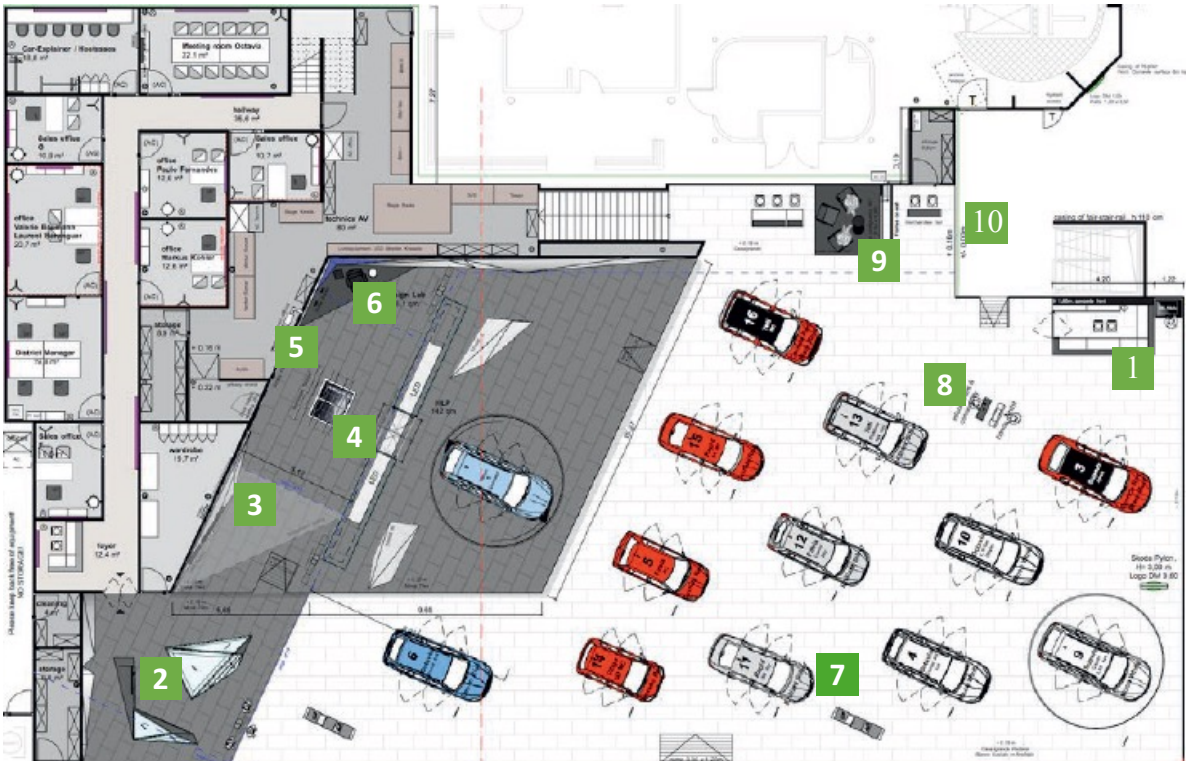
Communication topic: design and a new direction of ŠKODA design

Hostesses (girls who distribute leaflets and provide information) are local ones, supplied by the importer. Models by highlight cars are always Czech, asked for in various modeling agencies in the Czech Republic. The selection is based on the casting, the emphasis is put on friendly, outgoing, smiling girls.

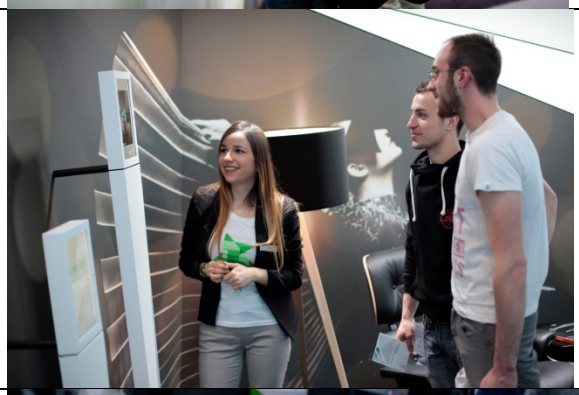
Main activities

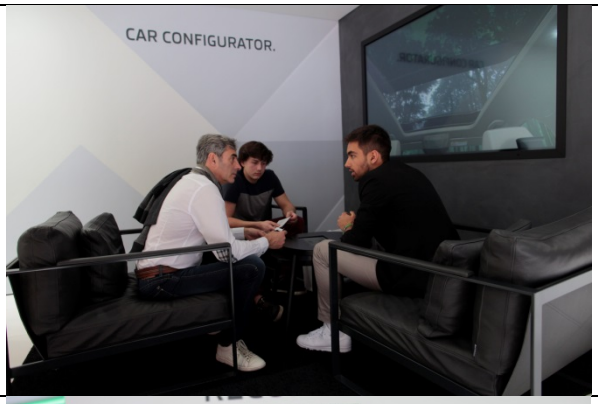
- "Human touch" aspect – ŠKODA tried to offer visitors of the stand the experience from the stay there in the form of so-called Customer journey.
- The purpose is to introduce ŠKODA brand to visitors, include them into activities at the stand, differentiate itself from competitive brands, and gathering contacts.
- Procedure CJ:
  1) A visitor is registered at info counter and gets the card with questions/requirements for an activity
  2) A visitor replies to questions/takes part in an activity at the stand
  3) A visitor comes to so-called "merchandise gallery" where he/she chooses a promotional item based on the number of correctly replied questions/carried out activities

Single touchpoints of "Customer journey"



1	**Info counter** – in case of interest, visitors took catalogs, registered for testing drives and received ŠKODA sun glasses	
2	**Merchandise shop** – the sale of ŠKODA brand products for special prices for visitors of the motor show	
3	**HMI (Human Machine Interface) Exhibit –** exhibit which by means of the video and touch screens showed the future technical development of ŠKODA cars	
4	**Multi-touch table** – exhibit where customers could play 2 games. (1. Perfect shapes – tangram, 2. Perfect matches – creation of own mood world and the recommendation of ŠKODA car)	

5	**Simply Clever Gallery** – visitors could watch some videos representing SC elements by means of scanned QR code	
6	**Selfie stations** – visitors could take selfie photos and adjust them graphically into polygonal shapes by means of filters	
7	**Benches** – visitors got acquainted with sponsoring activities of ŠKODA AUTO through games on iPad and at the same time they could recharge their mobile phones	
8	**Connectivity area** – 2 exhibits which familiarized visitors with connectivity (smart phone exhibit – by means of games, connectivity exhibit – by means of the demonstration of connecting a radio and a telephone)	

9	**Car configurator** – visitors could configurate ŠKODA car according to their ideas	
10	**Merchandise gallery** – visitors could choose a promotional item based on the number of correctly replied questions/carried out activities	

Results of visitors rate of "Customer journey"

Distribution voucher outdoor	Voucher outdoor received	%	Registration customer journey	Finished customer journey	%
30,150	10,137	35.7	8,171	9,150*	103.2%

**Only persons older than 18 years are registered for CJ. However, the cards were distributed also to children of formerly registered parents without registration.*

Project budget

The following items are paid from the budgets of other departments:

- Production of motor show cars
- Facilities and construction elements of the stand usable for other exhibitions
- Clothes for staff
- Exhibits production

The project budget in millions of EUR, < EUR 3,000,000

Total amount divided in the following proportion

Architecture	**48%**
Stand construction	84%
Agency fee	12%
Graphics	4%
Communications	**25%**
Agency fee	70%
Communication concept	19%
Media	11%
Technical facilities	**12%**
Light	53%
Video	25%
Audio	6%
Agency fee	16%
Stand Operations	**15%**
Motor show grounds costs	88%
Staff	10%
IT	2%

ŠKODA AUTO organizes a lot of various events within different sections of Marketing Communications department, however, none of identified events was targeted to students. And since ŠKODA AUTO wants to become top employer with global talent pool, it should focus more on the target group of students, both Czech and international.

In the next subchapter the event tailored for the target group of students will be modeled based on the answers from the questionnaire distributed to students.

4.2.2 Modeling

Based on the range of ŠKODA AUTO marketing communications events it was decided to create a conceptually different event, therefore, the idea of organizing an open air music festival for Czech as well as international students seemed convenient.

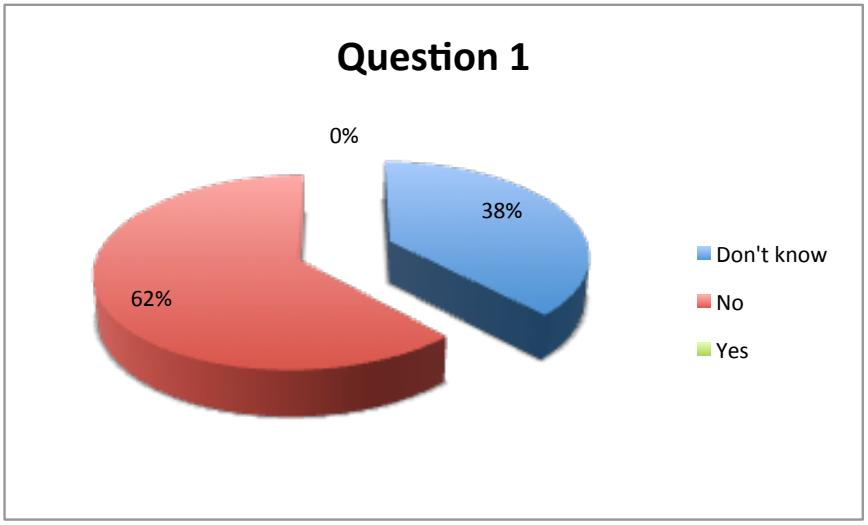
To identify if the was a reasonable decision and that the idea of the organization of ŠKODA AUTO Open Air Festival might achieve success among both Czech and international students, the questionnaire for students was designed to evaluate their perceiving of ŠKODA AUTO company and its approach towards students. The questionnaire was conducted via Qualtrics research software and distributed within the

period of 25 – 29 January 2016 to the total number of 142 international students. 118 questionnaires were completed, therefore, the questionnaire return rate was 81.3 %. The number of students represented different nationalities were as follows:

- Czech: 44
- French: 31
- German: 27
- Swiss: 22
- Italian: 18

According to questionnaires distributed among Czech and international students it was found out that students cannot identify any ŠKODA AUTO event connected especially with students, therefore, the decision to organize such an event was reasonable (see Graph No: 1).

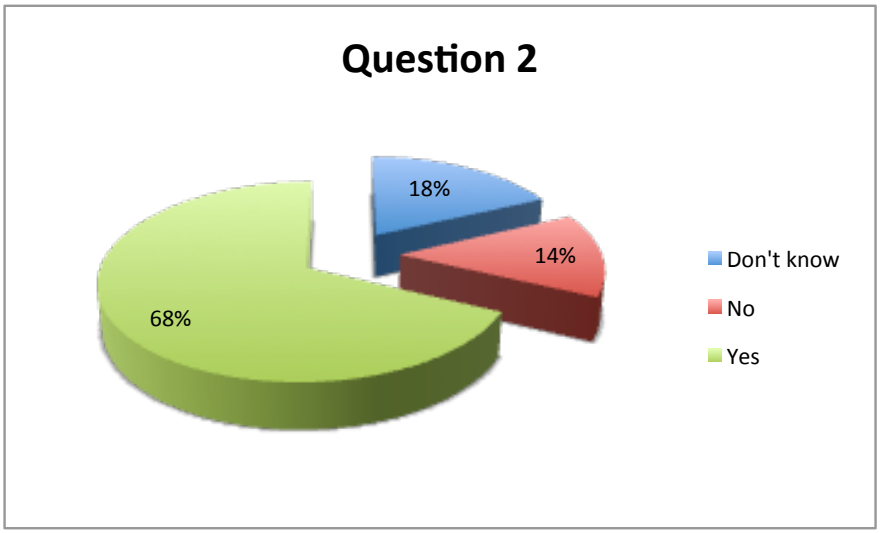
Graph No. 1: "Do you perceive any ŠKODA AUTO event as an event focusing on students?"



Source: Own processing (2016)

To assess if it is worthy to organize such an event and if it might achieve success among success by both Czech and international students, the question "Would you be interested in taking part in ŠKODA AUTO Open Air Festival?" was asked (see Graph No.: 2).

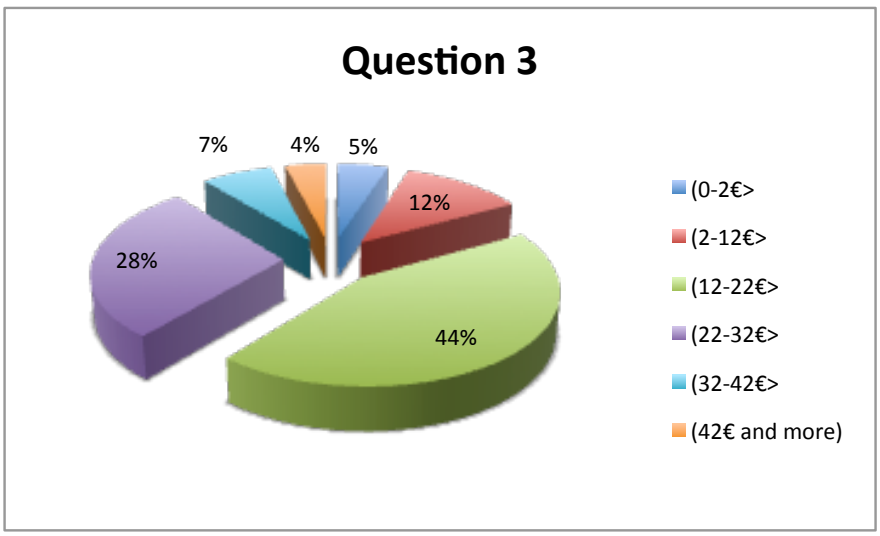
Graph No. 2: "Would you be interested in taking part in ŠKODA AUTO Open Air Festival?"



Source: Own processing (2016)

To identify in what price to approximately set the initial ticket price, following question was given: "Assume that your favorite music band would participate within ŠKODA AUTO Open Air Festival. In which of following ranges the highest price ticket you would be willing to pay is?"

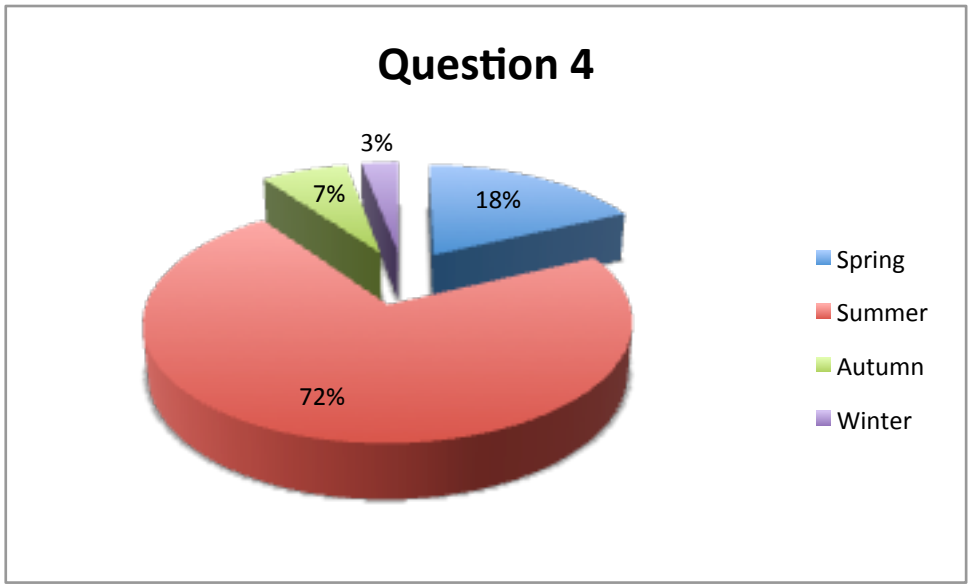
Graph No. 3: "Assume that your favorite music band would participate within ŠKODA AUTO Open Air Festival. In which of following ranges the highest price ticket you would be willing to pay is?"



Source: Own processing (2016)

To know in which season the open air festival should take place the question "In which season would you prefer the open air festival to take place?" was asked.

Graph No. 4: "In which season would you prefer the open air festival to take place?"



Source: Own processing (2016)

Because ŠKODA AUTO is already well-known in the Czech Republic and the second highest number of positive answers regarding the interest of participating in ŠKODA AUTO open air festival was from German students (note: 37 % of all who said "Yes", the highest number of positive answers was from Czech students) and ŠKODA AUTO wants to go even more global and have the talent pool of international students as its employees (one of ŠKODA AUTO Strategy Growth goals is literally: "become top employer with global talent pool"), the first year of ŠKODA AUTO Open Air Festival will be modeled to take place in Germany. Moreover, Germany is closer to other students from Switzerland, France and Italy than the Czech Republic itself is, while still being close enough to the Czech Republic, therefore, it is a good compromise. The advertising costs connected with the propagation of the first year of ŠKODA AUTO will be set up to EUR 21,000 (the given number as well as other numbers, necessary for the demonstration of a modeling technique and its benefits for project management team of Marketing Communications department, are taken from books about modeling and simulation). It is estimated that the first year of ŠKODA AUTO Open Air Festival will require a bigger promotion to gain the publicity,

therefore higher advertising costs. Following years should require less to zero advertising costs in case that the first year of the event is highly successful, attracts a lot of visitors and leave in them positive emotions connected with the event, thus the information about the event will even go viral and be sharing among people. It is up to the project manager how many events per year he/she will recommend to organize, and up to the Board of Management at ŠKODA AUTO how many events per year it will approve. However, the initial year will be held in the summer, since the summer season had the most supporters as it was found out via the questionnaire. By the means of the questionnaire it was also identified that the reasonable ticket price could be EUR 22. It was the middle value between two most often answers, which were (12-22€> and (22-32€>. The question whether it is a good estimate will be revealed during the simulation.

As far as the preparation of the open air festival itself, following facts should be taken into consideration:

The presence of music fans changes the liability situation, which requires additional insurance. Almost certainly, ŠKODA AUTO Open Air Festival needs to do additional cleanup after such an event. Since there is also risk of misbehavior, security people are needed. On the positive side, fans often make rational/irrational purchases from the concession stand and from the souvenir shop (which will be operated by ŠKODA AUTO and will include ŠKODA AUTO promotional items, branded clothes, etc.). The speculated scenario of ŠKODA AUTO Open Air Festival could look like this:

- An advertising cost of €21,000 will be used to bring in fans.
- A ticket seller will be recruited, who is paid with €500.
- The additional insurance costs are estimated at €7,000.
- An additional security person costs €500. However, if there are less than 500 fans (0-499), no security person is needed. 1 security person is needed for each full 500 fans, meaning one for 500-999, two for 1000-1499 etc.
- Some staff members are needed for logistic and organizational reasons, which will cost €10,000 for an event. They are paid with or without musicians, and

with or without fans. If there are 400 or fewer fans, they can handle the cleanup. Each additional fan above the first 400 requires 80 cents worth of overtime.

- A separate company as a concession is running a diner on the farm. It is expected that the average fan spends €4.50 on food and drinks and ŠKODA AUTO gets 30% of the concession's gross revenue.
- ŠKODA AUTO Open Air Festival will open up a souvenir shop and it costs €800. The average dollar of sales brings in 40 cents of margin, and only 20% of fans buy anything. If a fan spends any money, on average he or she will spend €50.
- The ticket price is set for €22.

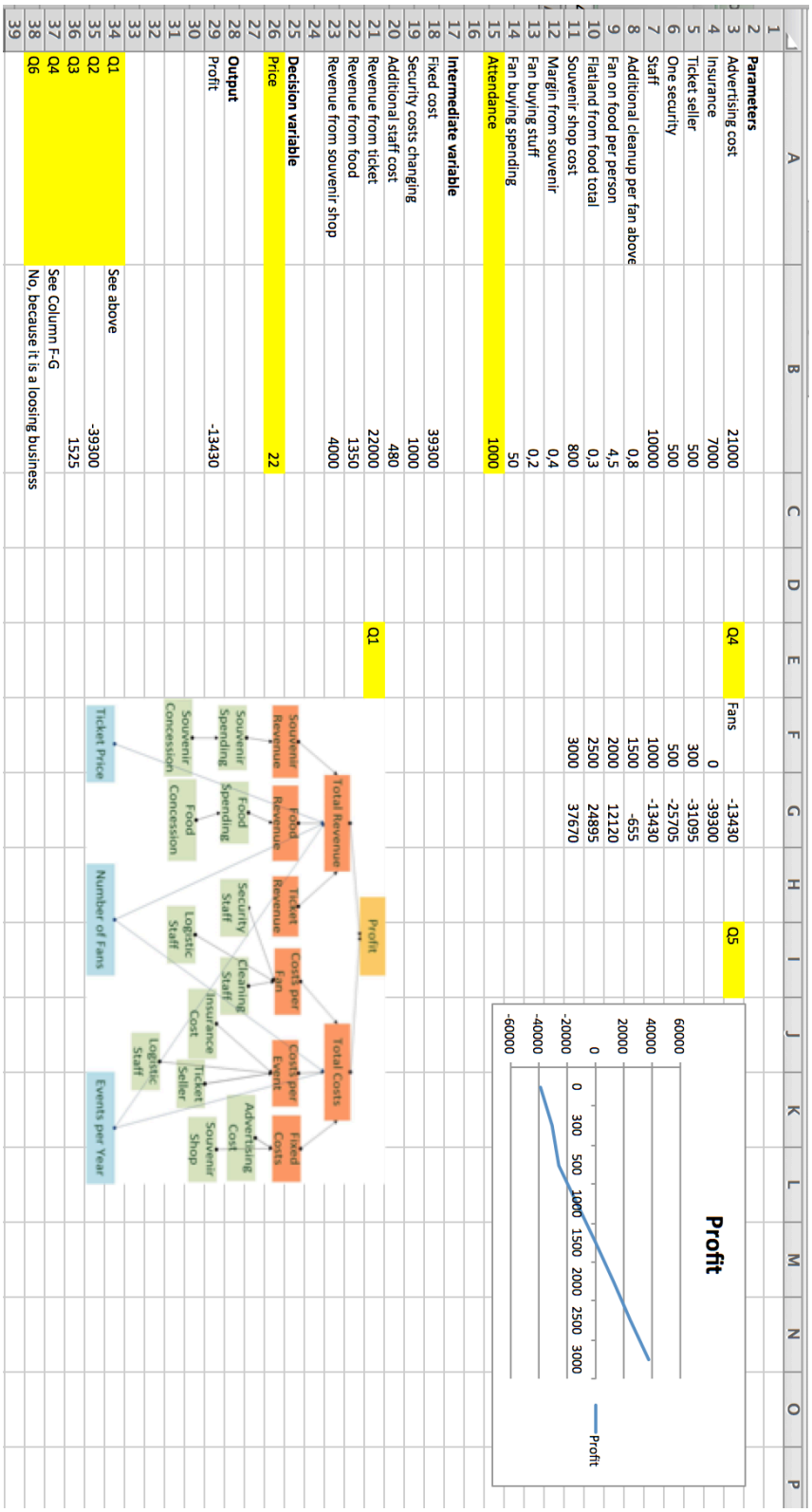
Construction of the model

The following five steps determine the building of a model in a spreadsheet:

1) Describing and understanding the managerial situation
2) Building the influence diagram that links various variables
3) Specifying the kinds of variables that reflect aims
4) Determining equations
5) Building the given model in spreadsheets

According to the facts above, following model was created:

Figure No. 3: ŠKODA AUTO Open Air Festival – Modeling



Source: Own processing (2016)

Thanks to the construction of a given model following answers, valuable for the project manager of events, can be answered:

Q1: What are the types of variables and how the influence diagram will look like?
See the spreadsheet

Q2: How much does ŠKODA AUTO lose if no fan shows up?
EUR -39,300 (see Fixed cost). It was calculated using the formula =B3+B4+B5+B7+B11.

Q3: How many fans must ŠKODA AUTO Open Air Festival attract to at least break even (i.e. not losing)? A project manager will break-even when profit is zero.
1525 fans

4.2.3 Simulation

After conducting the modeling phase of the event, the different possible scenarios of the given event will be simulated to provide the project management team at ŠKODA AUTO with all possible outcomes when dealing with uncertainty. By these means the project manager will be also provided with the information whether it is profitable to actually prepare and organize the given event in reality, or if it is – as far as the profit or the loss is concerned – not beneficial at all.

It is always advantageous to be able to simulate the possible outcomes of various scenarios and therefore have the opportunity to evaluate the of the extent of the risk, be prepared for all potential threats and decide if it is valuable to take the risk or not. It might be perceived as a part of risk management for events.

If the realization of the event at place goes flawlessly and no crucial shortcomings within the organization of the open air festival appear (which should not be a case since ŠKODA AUTO has its events always perfectly organized), then at least the reputation and the goodwill of the company will be enhanced in any case.

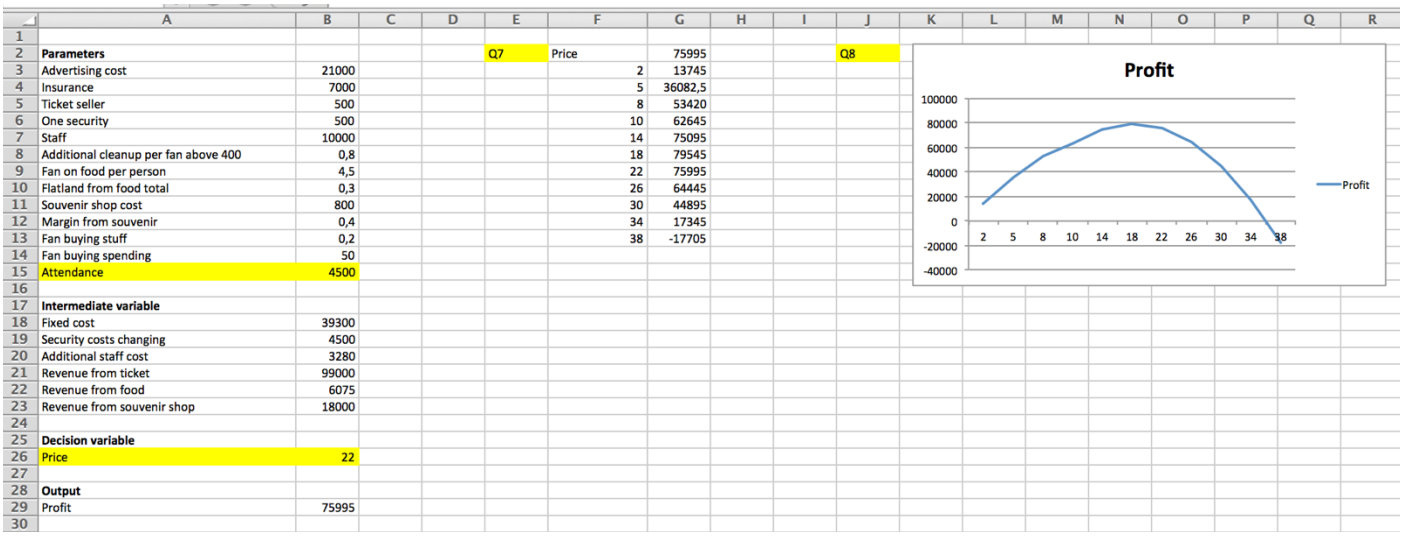
Q4: How much better or worse off is ŠKODA AUTO Open Air Festival if it attracts 0, 300, 500, 1000, 1500, 2000, or 2500 fans? Based on the equation =TABLE(;B15)

Fans:	EUR:
0	-39,300
300	-31095
500	-25705
1000	-13430
1500	-655
2000	12120
2500	24895
3000	37670

Q5: From the answer above, a graph showing the relationship between attendance and profit can be made (see the spreadsheet)

Q6: We can also set a question if it is profitable for ŠKODA AUTO to organize such event when expecting that 1000 fans would appear. The answer is obviously no, because the break-even point was at the number of 1525, therefore, ŠKODA AUTO would be losing. On the other hand, ŠKODA AUTO reputation and good-will would enhance in any case, and that might be the reason for creating the event.

Figure No. 4: ŠKODA AUTO Open Air Festival – Simulation



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1																		
2	**Parameters**				Q7	Price	75995			Q8								
3	Advertising cost	21000				2	13745											
4	Insurance	7000				5	36082,5											
5	Ticket seller	500				8	53420											
6	One security	500				10	62645											
7	Staff	10000				14	75095											
8	Additional cleanup per fan above 400	0,8				18	79545											
9	Fan on food per person	4,5				22	75995											
10	Flatland from food total	0,3				26	64445											
11	Souvenir shop cost	800				30	44895											
12	Margin from souvenir	0,4				34	17345											
13	Fan buying stuff	0,2				38	-17705											
14	Fan buying spending	50																
15	Attendance	4500																
16																		
17	**Intermediate variable**																	
18	Fixed cost	39300																
19	Security costs changing	4500																
20	Additional staff cost	3280																
21	Revenue from ticket	99000																
22	Revenue from food	6075																
23	Revenue from souvenir shop	18000																
24																		
25	**Decision variable**																	
26	Price	22																
27																		
28	**Output**																	
29	Profit	75995																
30																		

Source: Own processing (2016)

Q7: Since the ticket price was not fixed (EUR 22 was just an estimation according to the questionnaire), it is valuable to try how the outcomes will differ according to the change of the ticket price, i.e. how the profit will look like with different scenarios and how many fans will appear. According to the historical data the attendance of music fans during similar festivals can be described in the function: Attendance = 10,000-250*Price. The possible profit for ŠKODA AUTO will be simulated based on following ticket prices in EUR: 2, 5, 8, 10, 14, 18, 22, 26, 30, 34 and 38 based on the formula =TABLE(;B26),

Price in EUR	Profit in EUR
2	13,745
5	36,082.5
8	53,420
10	62,645
14	75,095
18	79,545
22	75,995
26	64,445
30	44,895

34	17,345
38	-17,705

Q8: In the graph it is possible to see that the profit is not directly proportional to the price of the ticket, i.e. the profit is not constantly increasing even though the price of the ticket is constantly increasing, however, when the ticket price reaches certain point (specifically EUR 18), after this point the profit starts to decrease. This might be an important insight for the project manager of ŠKODA AUTO Open Air Festival.

Summary of basic relations possible to use within Sales and Marketing department when modeling or simulating an event:

- Profit (π) = Sales (S) – Costs (C)
- Sales (S) = Price (P) * Quantity sold (Q1)
- Costs (C) = [Variable costs (VC) * Quantity produced (Q2)] + Fixed costs (FC) –
- $\pi = P*Q – (VC*Q + FC)$

4.2.4 Forecasting

As it was already mentioned before, ŠKODA AUTO also participates every year in Geneva International Motor Show (as well as other international motor shows). In this subchapter the utilization of another useful technique, which is forecasting, will be demonstrated on the example of Geneva International Motor Show.

Since forecasting is quite a demanding technique, a short overview of finding from the Theoretical part of the thesis might be beneficial:

Table No. 3: Overview of Methods for Forecasting

	Components	
Model	Trend	Seasonality
Classical Decomposition (Additive+Multiplicative)	x	x
Simple Moving Average		
Weighted Moving Average		
Simple Exponential Smoothing		
Holt	x	
Holt-Winters (Additive + Multiplicative)	x	x

Source: Own processing (2016)

Holt's exponential smoothing model

• There is a trend but no seasonality in the time series

The forecasting horizon

$F_{t+x} = L_t + x\, T_t$ → Trend

The level

where

- $L_t = \alpha\, Y_t + (1 - \alpha)\,(L_{t-1} + T_{t-1})$
- $T_t = \beta\,(L_t - L_{t-1}) + (1 - \beta)\, T_{t-1}$
- α and β are smoothing parameters (between 0 and 1)

Holt's exponential smoothing model

– L_t = estimate of the level of the series at time t

– α = smoothing constant for the data

– Y_t = new observation or actual value of series in period t

– β = smoothing constant for trend estimate

– T_t = estimate of the slope of the series at time t

– x = periods to be forecasted into the future

Holt's exponential smoothing model

- The weight α and β can be selected subjectively or by minimizing a measure of forecast error such as RMSE.
- Larger weights result in more rapid changes in the component.
- Smaller weights result in less rapid changes.

Holt's exponential smoothing model

• The initialization process for Holt's linear exponential smoothing requires two estimates:

– One to get the first smoothed value for L_1

– The other to get the trend T_1

• One alternative is to set

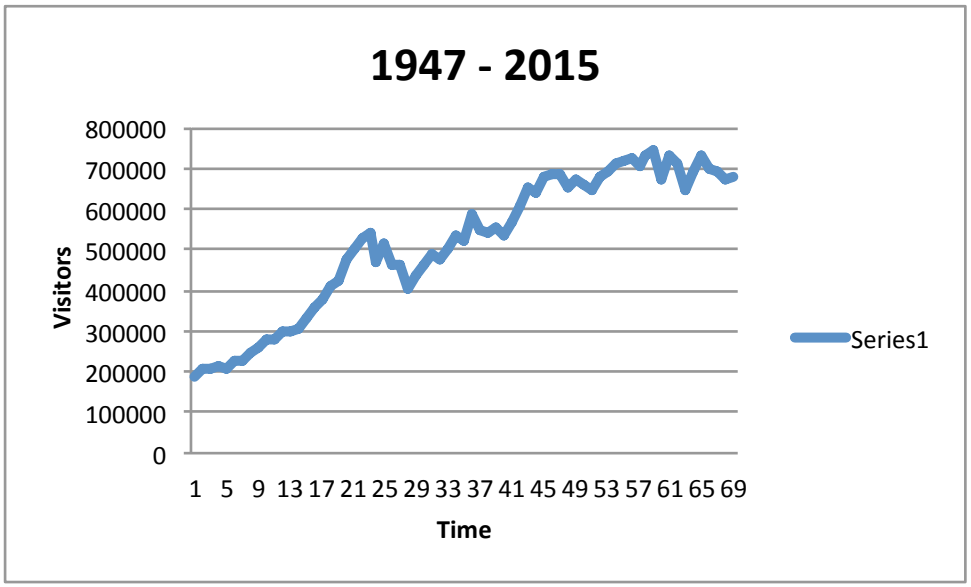
– $L_1 = Y_1$

– $T_1 = 0$

SOLVER function in Excel

The overview of Holt's exponential smoothing methods was given by intention, because after plotting of the data is possible to observe that there is a trend, but no seasonality. Therefore, Holt's exponential smoothing method is the right method to choose (for the complete range of years and the number of visitors during the years 1905 – 2015 see Appendix No.:)

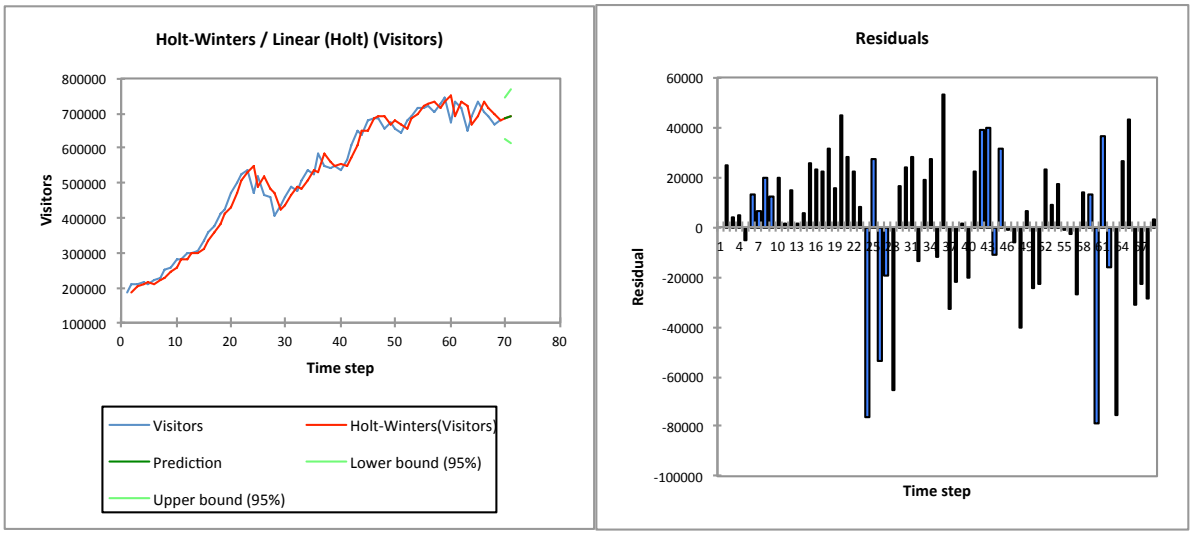
Graph No. 5: Geneva Motor Show Trend 1947 – 2015



Source: Own processing (2016)

When conducted Holt's exponential smoothing method, the following results were received:

Graph No. 6: Holt's Exponential Smoothing Model



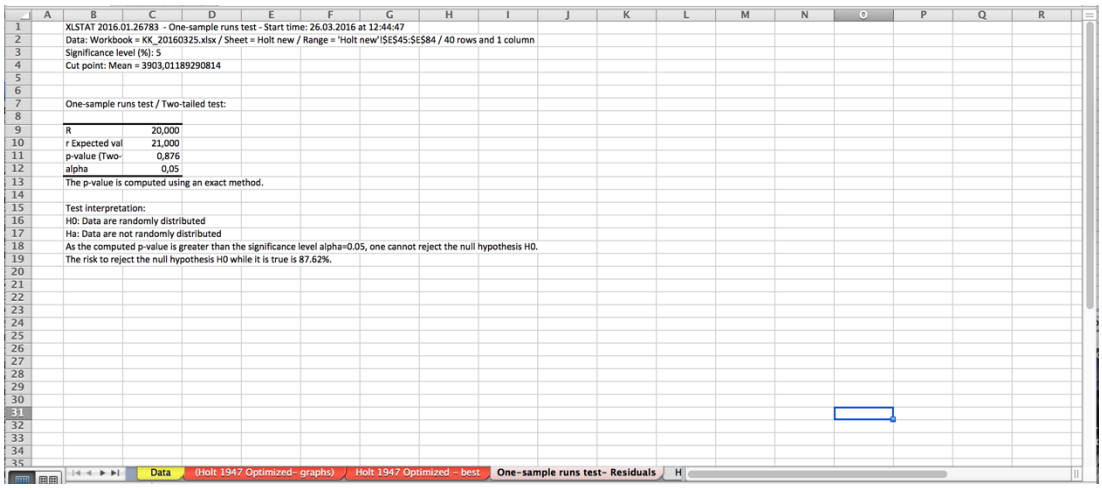
Source: Own processing (2016)

In the graph, there is possible to see the actual number of visitors as well as the prediction together with its upper and lower bound. The prediction of the number of visitors at Geneva International Motor Show for the year 2016 is 686,428 and for the year 2017 the prediction is 689,390 visitors.

Such information can help make more efficient project management of events are their related tasks and save costs. The example can be that the part of a portfolio of promotional items are so called launch collections which are prepared by PMK/2 – Promotional Items section at the time of launching a new car on the market. The goods are harmonized with a communication color of the car, labeled with the name of the new model and are intended particularly for attracting a new target group and increasing awareness about the new car at the time of its presentation. When knowing the number of visitors such event, more exact production of given promotional items can be made, and therefore costs can be saved.

After the processing of Holt's exponential smoothing method, One-sample runs test was made to check is the residuals are randomly distributed. Only if residuals are randomly distributed, then the selected method was correc. In other words, the correlation between residuals indicates incorrect model structure.

Figure No. 5: One-sample runs test



Source: Own processing (2016)

Test interpretation:

H0: Data are randomly distributed

Ha: Data are not randomly distributed

As the computed p-value is greater than the significance level alpha=0.05, one cannot reject the null hypothesis H0.

The risk to reject the null hypothesis H0 while it is true is 87.62%.

5 EVALUATION OF RESULTS AND RECOMMENDATIONS

On the basis of the interview with Marketing Communications project manager, the findings show that there is always only one project manager who cooperates with several colleagues (5 or 6) and with specialist departments such as Information Technologies department, Public Relations department, Production department, Design department etc. Marketing Communications department does not use the hierarchical structure of activities, sub-activities and tasks, i.e. does not use the Work Breakdown Structure, but uses the services of external event agencies for the project managament of events. The agencies prepare the whole Logical Framework of the project including intention, objectives, outputs and activities. The department does not set up their goals according to the SMART technique (i.e. that goals should be Specific, Measurable, Achievable, Realistic and Time-bound) either.

Based on the expression of the project manager, they utilize neither Gantt charts, nor network diagrams such as Program Evaluation and Review Technique, Critical Path Method or Arrow Diagrams Method.

The external agency prepares the Communication Plan of the project that answers important questions for the implementation of the project such as What does the company want to realize? Why? Where? For how much? When? Who will realize it? etc. Marketing Communications department does not do any Risk analysis and any Risk identification and do not use any of the following methods such as Delphi Method, Brainstorming, Crawford Slips, Root Cause Identification, SWOT analysis, Individual discussions with specialists, Lessons from historical projects etc., they do not hire any agencies for these methods. They do not use Detailed Risk Register either.

Marketing Communications department continuously controls the implementation of the project and they finally evaluate the project together with the hired agency, press department and importer. Conclusions and recommendations from the so called debrief are used for the improvement of future exhibitions.

The final question concerned the use of any econometric or decision-making techniques utilizing computers, such as modeling, simulation or forecasting, when preparing events. From the interview it follows that Marketing Communications department does not use any of these above mentioned techniques.

The second interview was carried out with the managing director of Volkswagen Group Import Company Ltd. China. They do a lot of events and projects, however, in their area, they do not prepare and realize any projects that require the typical project tools. When they have projects, they normally know them quite well, as they are repetitive, for instance motor shows are by project all the same. Therefore, the team of Marketing Communications department has experience, and they can dispense of analytical tools. The project review is done in details after the project finishes to get lessons learned and project improved for future motor shows. Volkswagen AG does not use within its project management any analytical or software tools while preparing and organizing events. They typically have their own personnel to steer the project and usually employ the external project team.

Based on the results of interviews, it could be recommended for Marketing Communication department of both companies to use Risk analysis and Risk identification and some of the following methods such as Delphi Method, Brainstorming, Crawford Slips, Root Cause Identification, SWOT analysis, Individual discussions with specialists, and particularly to use demonstrated econometric or decision-making techniques utilizing computers, such as modeling, simulation or forecasting, when preparing events as it could help make the project management more effective and less costly. They should also utilize Gantt charts, network diagrams such as Program Evaluation and Review Technique, Critical Path Method or Arrow Diagrams Method.

ŠKODA AUTO also uses the services of external agencies and as it was indentified, the costs of using specialized event agency are quite high (the agency fee takes cca 15 % of the total budget of millions of EURO allocated for the event itself. If it was feasible and the project management team at ŠKODA AUTO had all necessary skills and was capable to take over the tasks related to the entire planning and preparation of marketing communications

event, which have been carried out by external event agencies so far, ŠKODA AUTO company would save considerable amount of money.
Based on the results of questionnaires, it follows that ŠKODA AUTO could do, besides the above mentioned, open air festivals and other events to attract students' attention. ŠKODA AUTO already organizes open days for interested students. However, ŠKODA AUTO could organize also workshops for them on regular basis, monthly or quarterly. Then the classical decomposition method or Holt-Winters methods would be applicable since monthly and quarterly data often include both seasonality and trend.

On the other hand the question arises if it would not bring a lot of useless administration as ŠKODA AUTO is a multinational corporation with a long lasting tradition and experience, and has been dealing with events for a long time and they are at a high level. The issue and the question for next research could be the usage of these techniques in external hired agencies or the continuation of the identification of project management of events within Marketing Communications department at ŠKODA AUTO quarterly (alternatively monthly) data. So that the principle of Classical Decomposition method could be demonstrated on quarterly or monthly data which include both trend and seasonality.

6 CONCLUSION

The main aim of the diploma thesis was to bridge the gap between the project management of events, and econometric as well as decision-making techniques and in this way to innovate the project management of events within the Marketing Communications department at ŠKODA AUTO a.s. The partial objectives included the classification of theoretical knowledge about project management of events, provision of a concise overview of the company, identification of the project management events, demonstration of econometric and decision-making techniques and provision of project managers of marketing communications events at ŠKODA AUTO a.s. with the sufficient theoretical as well as practical knowledge of applying econometric and decision-making techniques, such as modeling, simulation and forecasting.

Project managers are at present responsible for building analytic models to help the company increase profits, reduce costs, or manage operations more efficiently. By all these means, the company gains a desirable competitive advantage in the current rapidly changing marketplace.

Econometric and decision-making techniques were used to analyze data and thus help clarify important business decisions. Using the quantitative techniques such as modeling and scenario-based planning can help project managers make better decisions. Simulation can be used to develop a wide range of plans from tactical contingency planning to fundamental changes in business strategy. Forecasting techniques can be used as a tool to guide business decisions.

The research was based on the outputs from quantitative and qualitative methods. The analysis of a current situation concerning the project management of marketing communications events was based on the internal information gained at ŠKODA AUTO a.s..The questionnaire survey of Czech as well as international students was conducted as the part of a quantitative method, the participating observation within ŠKODA AUTO a.s. company, and two standardized interviews were used as qualitative methods.

The analysis showed the insufficiences in the runing projects such as not using within its project management any analytical or software tools while preparing and organizing events and not showing interest in the student´s target group, that is why the modeling of an event was conducted. Afterwards, the different scenarios of the event were simulated and the possible profit for ŠKODA AUTO company was calculated. The innovative use of modeling, simulation and forecasting within the project management of marketing communications events at ŠKODA AUTO a.s. was demonstrated using Microsoft Excel, its add-in Solver and the statistical software XLSTAT on the examples of events tailored for ŠKODA AUTO a.s. The practical demonstration of the forecasting technique was based on the data regarding Geneva International Motor Show with the use of Holt' exponential smoothing method and One-sample runs test.

Nowadays, companies compete in a global economy and that is why strategic decisions are very important in all aspects of the corporate structure. Companies are aware of the fact that their successfull operation on the global market necessitates the improving of their decision-making processes.

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8 APPENDIX

8.1 List of Appendices

Appendix No. 1: Interview with ŠKODA AUTO Project Manager

How big is your project team? (e.g. 1 project manager and 3 executive project team members)

Projektový manager je vždy jen jeden + spolupracuje s několika kolegy (odhadem 6), dále s odbornými útvary (IT, PR, výroba, design, aj.)

Do you do project management of events solely by yourself or do you use sevices of external event agency?

Používáme externí agentury

When preparing an event, do you use Work Breakdown Strucutre (WBS), i.e. hierarchical structure of activities, sub-activities and tasks?

NE

Do you create Logical Framework (LF) of the project (LF includes intention, objectives, outputs and activities)?

Vše připraveno agenturou

Do you set up your goals according to SMART technique (i.e. that goals should be Specific, Measurable, Achievable, Realistic and Time-bound)?

NE

Do you use Gantt charts? If yes, do you model them with Microsof Project software?

NE

Do you use network diagrams (e.g. Program Evaluation and Review Technique (PERT), Critical Path Method (CPM) or Arrow Diagrams Method (ADM))? If yes, please specify.

NE

Do you use Communication Plan of the project? (i.e. the plan answering questions such as What does the company want to realize? Why? Where? For how much? When? Who will realize it?)

Připraveno agenturou pro jejich použití

Do you do Risk analysis? If yes, please specify which (qualitative / quantitative / both).

NE

Do you do Risk identification? If yes, do you use any of following methods? Please tick which one(s).

Nic z níže uvedeného

a) **Lessons from historical projects**
b) **Brainstorming**
c) **Delphi Method**
d) **Individual discussions with specialists**
e) **Crawford Slips**
f) **Root Cause Identification**
g) **SWOT analysis**
h) **Lists**
i) **Ishikawa diagram, flowcharts, network diagrams**
j) **Other, which? _____**

Do you use Detailed Risk Register?

NE

Do you do the control of the project? If yes, do you do it during the entire duration of the project?

Průběžně a po skončení následuje debrief, kde se ,,poučíme,, pro příště

Do you do the final evaluation of the project? If yes, by what means?

Ano, debrief s agenturou, tiskovým oddělením a importérem. Ke zlepšení budoucích výstav.

Do you use any econometric or decision-making techniques utilizing computers, such as modeling, simulation or forecasting, when preparing events? If yes, please specify.
NE

Source: Own processing (2016)

Appendix No. 2: Interview with Mr. Axel Schröder, managing director of Volkswagen Group Import Company Ltd. China

How big is your project team? (e.g. 1 project manager and 3 executive project team members)

Do you do project management of events solely by yourself or do you use sevices of external event agency?

When preparing an event, do you use Work Breakdown Strucutre (WBS), i.e. hierarchical structure of activities, sub-activities and tasks?

Do you create Logical Framework (LF) of the project (LF includes intention, objectives, outputs and activities)?

Do you set up your goals according to SMART technique (i.e. that goals should be Specific, Measurable, Achievable, Realistic and Time-bound)?

Do you use Gantt charts? If yes, do you model them with Microsof Project software?

Do you use network diagrams (e.g. Program Evaluation and Review Technique (PERT), Critical Path Method (CPM) or Arrow Diagrams Method (ADM))? If yes, please specify.

Do you use Communication Plan of the project? (i.e. the plan answering questions such as What does the company want to realize? Why? Where? For how much? When? Who will realize it?)

Do you do Risk analysis? If yes, please specify which (qualitative / quantitative / both).

Do you do Risk identification? If yes, do you use any of following methods? Please tick which one(s).

a) **Lessons from historical projects**
b) **Brainstorming**
c) **Delphi Method**
d) **Individual discussions with specialists**
e) **Crawford Slips**
f) **Root Cause Identification**
g) **SWOT analysis**
h) **Lists**
i) **Ishikawa diagram, flowcharts, network diagrams**
j) **Other, which? _____**

Do you use Detailed Risk Register?

Do you do the control of the project? If yes, do you do it during the entire duration of the project?

Do you do the final evaluation of the project? If yes, by what means?

Do you use any econometric or decision-making techniques utilizing computers, such as modeling, simulation or forecasting, when preparing events? If yes, please specify.

dear kristyna, well, a little bit tough to answer. we do a lot of events and projects. however in our area none that require the typical project tools. when we have projects, we normally know them quite well, as they are repetitive. e.g motor shows are by project all the same. therefore team has experience, and we can dispense of analytical tools. project review is done in details afterwards to get lessons learned. but we do not use software tools for any of our projects. we usually employ external agencies, so we typically have our own personnel to steer the project and the external project team.

Source: Own processing (2016)

Appendix No. 3: Questionnaire for Czech and International Students

"Do you perceive any ŠKODA AUTO event as an event focusing on students?"
Yes / No / Don't know

"Would you be interested in taking part in ŠKODA AUTO Open Air Festival?"
Yes / No / Don't know

"Assume that your favorite music band would participate within ŠKODA AUTO Open Air Festival. In which of following ranges the highest price ticket you would be willing to pay is?"
(0-2€> (2-12€> (12-22€> (22-32€> (32-42€> (42€ and more)

"In which season would you prefer the open air festival to take place?"
Spring / Summer / Autumn / Winter

Please indicate your gender.

Please indicate your nationality.

How old are you?

Source: Own processing (2016)

Appendix No. 4: Geneva International Motor Show Years 1905 - 2015

1905		13	13000	First show
1924	6,153 m²	68	68000	First international show
1947	9,608 m²	185	185000	First show after the war
1948	13,760 m²	**210**	210000	Surpasses 200,000 visitor mark
1949	15,530 m²	210	210000	
1950	14,530 m²	215	215000	
1951	15,853 m²	210	210000	
1952	16,333 m²	225	225000	
1953	16,500 m²	230	230000	
1954	19,035 m²	250	250000	
1955	20,258 m²	260	260000	
1956	22,290 m²	280	280000	
1957	24,031 m²	280	280000	
1958	29,627 m²	297	297000	
1959	31,900 m²	299	299000	
1960	32,238 m²	**307**	307000	Surpasses 300,000 visitor mark
1961	36,305 m²	334,349	334349	
1962	37,942 m²	356,319	356319	
1963	28,230 m²	379,103	379103	
1964	39,381 m²	**411,677**	411677	Surpasses 400,000 visitor mark
1965	28,396 m²	426,792	426792	
1966	41,092 m²	474,854	474854	
1967	29,061 m²	**502,176**	502176	Surpasses 500,000 visitor mark
1968	43,921 m²	526,775	526775	
1969	33,330 m²	539,176	539176	
1970	29,840 m²	469,587	469587	
1971	33,200 m²	517,54	517540	
1972	32,300 m²	465,896	465896	

1973	32,600 m²	462,393	462393	
1974	32,700 m²	406,044	406044	
1975	33,500 m²	437,716	437716	
1976	33,500 m²	462,61	462610	
1977	34,000 m²	491,62	491620	
1978	34,700 m²	478,325	478325	
1979	34,700 m²	505,219	505219	
1980	34,500 m²	534,349	534349	
1981	**34,200 m²**	524,264	524264	Last show in the old building
1982	38,240 m²	585,332	585332	First show at Palexpo
1983	37,927 m²	550,271	550271	
1984	36,880 m²	540,75	540750	
1985	37,836 m²	552,121	552121	
1986	37,844 m²	537,432	537432	
1987	**49,200 m²**	568,85	568850	Hall 5 opens
1988	50,166 m²	**609,709**	609709	Surpasses 600,000 visitor mark
1989	50,170 m²	649,968	649968	
1990	50,450 m²	639,534	639534	
1991	50,422 m²	681,14	681140	
1992	51,703 m²	683,107	683107	
1993	51,452 m²	685,22	685220	
1994	51,459 m²	654,439	654439	
1995	**58,262 m²**	675,761	675761	Hall 7 opens
1996	62,704 m²	657,781	657781	
1997	63,192 m²	646,596	646596	
1998	64,095 m²	680,356	680356	
1999	63,710 m²	691,667	691667	
2000	63,527 m²	714,179	714179	Surpasses 700,000 visitor mark
2001	63,877 m²	718,473	718473	

2002	63,500 m²	723,143	723143	
2003	**76,650 m²**	703,9	703900	Hall 6 opens
2004	76,650 m²	729,629	729629	
2005	75,912 m²	**747,7**	747700	All-time visitor record
2006	77,000 m²	**674,334**	674334	Terrible weather conditions
2007	76,617 m²	730,736	730736	
2008	78,456 m²	714,559	714559	
2009	77,894 m²	648	648000	
2010	78,000 m²	692	692000	
2011	80,774 m²	735	735000	
2012	77,702 m²	702,014	702014	
2013	81,031 m²	690	690000	
2014	80,125 m²	670	670000	
2015			682000	

Source: ŠKODA AUTO (2016)