St. Petersburg State University

Graduate School of Management

Master in International Business

DETERMINANTS OF DIFFUSION AND PERFORMANCE OF THE INTERNET OF THINGS IN EVENT INDUSTRY

Master's Thesis by the 2nd year student

MITIM-2016

Alexander Klimov

Research advisor

Associate Professor

Dr. Tatjana A. Samsonowa

St. Petersburg

2016

ЗАЯВЛЕНИЕ О САМОСТОЯТЕЛЬНОМ ХАРАКТЕРЕ ВЫПОЛНЕНИЯ ВЫПУСКНОЙ КВАЛИФИКАЦИОННОЙ РАБОТЫ

Я, Климов Александр Олегович, студент второго курса магистратуры направления «Менеджмент», заявляю, что в моей магистерской диссертации на тему «Факторы, определяющие распространение и эффективность интернета вещей в event-индустрии», представленной в службу обеспечения программ магистратуры для последующей передачи в государственную аттестационную комиссию для публичной защиты, не содержится элементов плагиата.

Все прямые заимствования из печатных и электронных источников, а также из защищенных ранее выпускных квалификационных работ, кандидатских и докторских диссертаций имеют соответствующие ссылки.

Мне известно содержание п. 9.7.1 Правил обучения по основным образовательным программам высшего и среднего профессионального образования в СПбГУ о том, что «ВКР выполняется индивидуально каждым студентом под руководством назначенного ему научного руководителя», и п. 51 Устава федерального государственного бюджетного образовательного учреждения высшего профессионального образования «Санкт-

Петербургский государственный университет» о том, что «студент подлежит отчислению из Санкт-Петербургского университета за представление курсовой или выпускной квали- фикационной работы, выполненной другим лицом (лицами)».

____ (Подпись студента)
____ (Дата)

STATEMENT ABOUT THE INDEPENDENT CHARACTER OF THE MASTER THESIS

I, Alexander Klimov, second year master stude**nt, program «Management», state** that my master thesis on the topic «Determinants of Diffusion and Performance of the Internet of Things in Event Industry», which is presented to the Master Office to be submitted to the Official Defense Committee for the public defense, does not contain any elements of plagiarism.

All direct borrowings from printed and electronic sources, as well as from master theses, PhD and doctorate theses which were defended earlier, have appropriate references.

I am aware that according to paragraph 9.7.1. of Guidelines for instruction in major curriculum programs of higher and secondary professional education at St.Petersburg University «A master thesis must be completed by each of the degree candidates individually under the supervision of his or her advisor», and according to paragraph 51 of Charter of the Federal State Institution of Higher Professional Education Saint-Petersburg State University «a student can be expelled from St. Petersburg University for submitting of the course or graduation qualification work developed by other person (persons)».

____(Student's signature)
____ (Date)

АННОТАЦИЯ

ФИО студента	Климов Александр Олегович
Тема магистерской диссертации	Факторы, определяющие распространение и эффективность интернета вещей в event-индустрии
Факультет	Высшая школа менеджмента, Санкт-Петербургский государственный университет
Программа	080200 «Менеджмент»
Год окончания	2016
ФИО научного руководителя	Самсонова Татьяна Александровна, доктор экономических наук
Описание целей, задач и основных результатов исследования	Цель данного исследования состоит в определении факторов, наиболее значимых для принятия решений об интеграции технологий, основанных на принципах «интернета вещей», в индустрии event-менеджмента, а также в нахождении наиболее оптимального сценария интеграции путём определения наилучших альтернатив для интеграции внутри индустрии. В качестве факторов принятия решений были использованы 11 факторов, неоднократно использовавшихся для достижения подобных исследовательских задач, в том числе в изучении интернета вещей. Эти факторы разделены на три ключевые группы: технический потенциал, рыночный потенциал и законодательная среда. В качестве альтернатив были использованы ключевые сервисы event-индустрии. Анализ был проведён с использованием множественной модели принятия решений (метод взвешенных сумм). Для моделирования решений были проведены интервью с пятью экспертами индустрии. В результате анализа были определены ключевые области с наибольшим потенциалом для интеграции решений, основанных на интернете вещей: маркетинг и операционная деятельность. Также были определены факторы, наиболее значимые для определения потенциала применения технологий «интернета вещей» в индустрии.
Ключевые слова	Интернет вещей, event-индустрия, модель принятия технологий, принятие решений

ABSTRACT

Master Student's Name	Alexander Klimov
Master Thesis Title	Determinants of Diffusion and Performance of the Internet of Things in Event Industry
Faculty	Graduate School of Management, Saint-Petersburg University
Program	080200 «Management»
Year	2016
Academic Advisor's Name	Dr. Tatjana A. Samsonowa, Associate Professor
Description of the goal, tasks and main results	The objective of this research is to identify the factors that most significantly affect decisions regarding adoption of Internet of Things-based technologies in event industry and to find the most optimal scenario of adoption by ranking several alternatives for integration present in the industry. 11 factors that were used multiple times for solving similar research questions (including Internet of Things adoption) were estimated in this research. These factors are divided into three key groups: technological prospect, market potential and regulatory environment. The key services of event industry were used as alternatives for decision making. The analysis was conducted by applying multi-criteria decision making model (weighted sum method). Five experts were interviewed in order to model the decision making process. As a result of the study, several key factors affecting adoption potential were identified: technical practicality, market demands, cost efficiency and standardization. The analysis also yielded the following key fields with the highest potential for Internet of Things-based solutions adoption: event marketing and event operations.
Keywords	Internet of Things (IoT), event industry, diffusion of innovation, decision making

TABLE OF CONTENTS

INTRODUCTION

The Internet of Things (or IoT for short) can be defined as a set of objects that present around people and can exchange information with each other, thus achieving common goals through cooperation.

The future application of the IoT is twofold. Most of us would agree that IoT is the technology that already today impacts our lives, our behaviors and our choices significantly; at the same time we are confident that this technology will be applied in a broad variety in the future. Nonetheless, observing the current practice, it is hard to define how and where it is going to be implemented next.

Driven by IT industry, there are many prominent other industries where adoption of IoT is happening currently, especially in industrial (business-to-business, or B2B) context, for example automotive, buildings and home automation or manufacturing, just to name a few where "smart" technology is "on the spot". The adoption of IoT in B2C (business-to-consumer) has got off to a sensationally good start, especially featuring solutions in the healthcare in the United States, where it is already feasible to provide insured people with wristbands tracking their body parameters, or home controls also in the US, where people have the possibility to remotely control devices in their homes such as temperature, humidity, etc. Enterprises also implement IoT in their processes to reach the new competitive edge: the most prominent applications currently are logistics, retail operations and predictive maintenance of equipment. However, for many industries future IoT technologies are still in the greenfield, and their actual form and application models are yet to be discovered.

This is the case for event management. There is a continuing discussion on how IoT can be applied for different types of events or for different connected activities, but it is going outside of scholarly research and lacks systematic approach currently. Scholars, on their side, currently focus on adopting IoT techniques in healthcare, inventory management and logistics. This situation calls for an investigation of factors and potential uses of the Internet of Things to help industry players identify what should be the next steps in developing new services and plan adoption of the technology.

Our goal is to identify, measure and rank the crucial drivers and barriers that are likely to affect adoption of wearable technology on mass events. To accomplish this, we aim to explore the currently existing literature on the topic, defining the current state-of-the art in particular and exploring connections between Internet of Things and event industry in the first part of the thesis. In the second part, the weighted sum method used to simulate decision making will be described, together with the process of expert sampling and interviewing. In the third part we will investigate the factors that affect diffusion and performance of wearable technologies in entertainment industry and make an attempt to define the most prominent areas where it can be applied. Finally, in the fourth part we will make conclusions and formulate recommendations for the industry stakeholders based on our findings.

1 LITERATURE REVIEW

1.1. Internet of Things Theoretical Background

One of the current challenges IoT research faces is an agreement upon a common definition of the IoT concept. The literature on topic is extremely diffused. To begin with, the 'Internet of Things' term is often mentioned in connection with technology. Therefore, we should give a proper definition to Internet of Things and identify whether it is a technology or not, as this will set the course to the whole research. In order to do so, we will find the modern understanding of the term 'technology' and try to connect it with the currently central definitions of IoT.

The Oxford Dictionary identifies technology as '*the application of scientific knowledge for practical purposes, especially in industry*'. The Merriam-Webster Dictionary proposes the following definitions: '*the practical application of knowledge especially in a particular area'*; '*a manner of accomplishing a task especially using technical processes, methods, or knowledge'*; and, finally, '*the specialized aspects of a particular field of endeavor'*.

Arthur (2009) identifies three definitions of technology. According to the first one, technology is '*a means to fulfill human purpose*'. The second definition defines technology as '*an assemblage of practices and components*', and the third refers to technology in the most plural sense, as to the '*entire collection of devices and engineering practices available to a culture'*. Considering the scope of our topic, we will limit ourselves to the first two definitions mentioned.

Table 1 - Comparison of technology definitions

Oxford Dictionary	Application of scientific knowledge for practical purposes		
Merriam-Webster Dictionary	Practical application of knowledge	Manner of accomplishing a task <…> using technical processes, methods or knowledge	Specialized aspects of a particular field of endeavor
W. Brian Arthur	a means to fulfill human purpose	an assemblage of practices and components	entire collection of devices and engineering practices available to a culture

International Telecommunication Union (2012), a division of the United Nations that is widely accepted as the regulator of IoT standards, defines the IoT concept as a "global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies."

Consulting agency Gartner (2012) proposes that it "is the network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment".

Finally, Minerva et al. (2015) argue that all such definitions are biased towards the assets in question. To solve the problem, they propose two different definitions of the Internet of Things based on the environment scope. In case of "small environment", there are one or several uniquely identifiable things which are connected to the Internet and thus provide users with a seamless access to the data generated by the sensors or actuators embedded into "things". In "large environment", the "things" are "interconnected to deliver a complex service and support an execution of a complex process", thus representing a complex system.

In case of small environment, the authors define IoT as "a network that connects uniquely identifiable "Things" to the Internet." In case of large environment their definition sounds as follows: "Internet of Things envisions a self-configuring, adaptive, complex network that interconnects 'things' to the Internet through the use of standard communication protocols."

Now we will try and synthesize our definitions of technology and Internet of Things to understand the nature of the latter and relations of the two.

As we have mentioned when investigating existing popular definitions of technology, we do not need to look at it as something ubiquitous. The same can be said about the narrower definitions. The first appropriate definition in the frame of our research should be 'the assemblage of practices and components', as it can be used to describe nearly every technology that has a practical use, from the simplest to complex ones. This will allow us to look at the Internet of Things as a subject that incorporates existing practices and methods, e.g. RFID, Wi-Fi or other means of wireless connection, etc.

The second definition that can be used here is 'a means to achieve human purpose'. It is more appropriate to use it when describing Internet of Things as a social phenomenon that affects daily lives or business practices. It is even more important to use this definition in the context of entertainment industry, which is naturally connected with the lifestyle (Lloyd & Clark, 2001).

Synthesizing these definitions, we draw the following conclusion for our research:

1. IoT is a way of connecting 'things' (wither virtual or physical) to the internet by using standardized communication protocols;

2. The “things” themselves have sensing or actuation capabilities, are programmable and uniquely identifiable;
3. Finally, the “things” offer certain services or new capabilities to the users – either by using the “individual” capabilities of the “things” or via the network of “things”.

We can also argue that IoT is not a technology but rather a concept that unites several technologies and makes them work in a new way described above. This opinion is supported by some authors, for example Lee & Lee (2015), who identify five essential IoT technologies:

- Radio frequency identification (hereinafter RFID for short);
- Wireless sensor networks (hereinafter WSN for short);
- Middleware;
- Cloud computing;
- IoT application software.

We must explore this set of technologies further to get a better understanding of them.

RFID technology, developed by MIT’s Auto-ID Center, enables seamless identification and data exchange using RFID tag and RFID reader connected via radio waves. RFID tag stores a specific amount of information that can be read and altered by the reader. There are three types of RFID tags:

- Passive: use energy from reader radio waves to be powered, do not use an external power source like battery, used in supply chains and passports.
- Active: use external data source and thus are able to initiate communication with a reader, as well as transmit data from connected sensors.
- Semi-passive: use batteries to read information from sensors and reader waves for communication.

Atzori et al. (2010) identify wireless sensor networks (WSN) as spatially dispersed devices with embedded sensors that monitor environmental and physical conditions. Their sensoring capability can be enhanced further if cooperating with RFID-equipped mobile devices.

WSNs are getting cheaper as the technology of low-power circuits and wireless communications is progressing and more and more companies start using them in their operations (Gubbi et al., 2013). General Electrics and American Airlines are implementing WSN and gathering large amounts of data through it to improve their preventive maintenance processes.

The next important technology that makes the Internet of Things possible is middleware. Middleware is an interconnecting software layer for different software applications that serves to ease organizing data interchange between such applications. This type of software became popular in the 1980s as software products reached such level of complexity where it became extremely difficult and time-consuming to specify data interchange methods for each new product. This led to a greater simplicity of development and boosted emergence of new IT solutions. The Windows operating system can be roughly categorized as middleware, as it has a lot of mechanisms that ease interaction of different software products.

In case of IoT, middleware is even more important than before: it is the only solution to the problem of connecting numerous devices which use different firmware. Another reason for using middleware is that the network topology is often unknown and is impossible to investigate.

One of the popular examples of today's IoT middleware is the IFTTT ('if this then that') application for smartphones that serves to generate conditional outputs and facilitate automated access to needed information.

Cloud computing is defined by Lee & Lee (2015) as 'a model of on-demand access to a shared pool of configurable resources'. In case of IoT, cloud computing is the best solution to store and analyze the huge amount of data generated by IoT-enabled devices, as most of such devices do not have required computing power due to their small size.

Finally, the Internet of Things, by nature, fosters development of numerous enterprise and consumer applications: human-computer interaction is the key for successful implementation of IoT, and this requires special tools that allow for quick and effective data monitoring and decision making. The worldwide logistics leader FedEx uses software developed by SenseAware to track vital characteristics of its packages, such as temperature and humidity.

Farooq & Waseem (2015) in their state-of-the-art review identify the following potential uses for Internet of Things technology:

Table 2 - State of the art in IoT enterprise applications (Farooq & Waseem, 2015)

Smart Traffic System	Adding IoT capabilities to transport vehicles and road infrastructure will provide features like automatic vehicle and free parking slots tracking, theft detection, accidents reporting and ultimately will lead to the more effective traffic with less damage to the environment and less energy consumption.
Smart Environment	This section refers to the control of the natural environment and will lead to predicting natural disasters (e.g. earthquakes) and controlling air pollution levels.
Smart Home	In this domain, a lot of routine that home owners have will be automatized (like plant watering in the garden), and utilities consumption will be more efficient.

Smart Hospitals	IoT implementation in healthcare will allow all medical personnel to constantly monitor health of their patients, and the intelligent vehicles like drones will decrease the response times for the ambulance.
Smart Agriculture	In agriculture, the monitoring of soil nutrition, air and water quality, etc. will be significantly easier with IoT capabilities, and the resources use will also become significantly efficient.
Smart Retailing and Supply-Chain Management	Use of IoT here is mostly connected with the RFID technology. It will allow accurate, automatic tracking of supplies and each individual product with an RFID chip embedded. This will also let retailers place their orders with suppliers automatically and build better stock strategies.

Above are the areas where a certain degree of progress was already achieved. For example, in most Russian major cities public transportation vehicles such as buses are equipped with GLONASS positioning sensors that track and transmit their location data in real time, enabling prediction of travel times.

Chui et al. (2010) have identified the following general applications for the Internet of Things.

Table 3 – Generalized enterprise applications for the Internet of Things. (Chui et al., 2010)

Application Group	Application Definition	Examples
Information and Analysis	Tracking behavior: monitoring the behavior of persons, things, or data through space and time	• Presence-based advertising and payments based on consumers' location • Inventory monitoring and management
	Enhanced situational awareness: facilitating real-time awareness of physical environment	• Sniper detection using sound direction to locate sound source (shooters)
	Sensor-driven decision analytics: assisting human decision making through deep machine-based analysis and data visualization	• Oil field site planning with 3D visualization and simulation • Continuous monitoring of chronic diseases to help find best disease treatment
Automation and Control	Process optimization: automated control of closed	• Maximization of refinery throughout using

	systems	wireless sensors • Continuous and precise adjustments in manufacturing lines
	Optimized resource consumption: control of consumption to optimize resource use in a network	• Smart meters and energy grids that match generation and consumption of resources to lower costs • Data center management that optimizes energy, storage and processor use
	Complex autonomous systems: automated control in open environments with great uncertainty	• Collision avoidance systems in vehicles • Cleaning hazardous materials through use of robots

To better assess feasibility of IoT application from the managerial point of view, it seems more appropriate to use more generic criteria that describe not only technical but also other parameters important for business applications. One such model was proposed by Bourgeois (1980) as part of technology studies and later refined and reviewed by Kim & Kim (2016) in context of Internet of Things.

However, we were more interested in areas where no significant progress was made yet, but the perceived potential for implementation of Internet of Things is very high. This is the case in the entertainment industry and large-scale event management in particular, which will be described in the next chapter.

1.2. Potential of Internet of Things Adoption in Event Management

Event management and event studies are seen by the top scholars involved in the relevant research as a part of the tourism industry. For example, Getz (2007) supports this view and explains that most special events are attracting a number of visitors from other regions (even if these are minor events, e.g. weddings) and thus bring tourism benefits to the destination where the named event is taking place.

The tourism industry is of an extreme importance today for the global economy, where its contribution had reached $7.58 trillion in 2015 (Statista, 2015). This accounts for approximately one tenth of gross world product (Statista, 2016). This is possible due to the increasing rate of globalization and achievements in transportation that enable people across the world to travel and explore anywhere they want.

The key object of the tourism industry is destination. Buhalis (2000) defines destination as an 'amalgam of tourism products and services which are consumed under the brand name of the destination'. Pike's (2004) definition is 'places that attract visitors for a temporary stay, and range from continents to states and provinces to cities to villages to purpose built resort areas'.

A lot of studies were devoted to the concept of destination competitiveness. Ritchie and Crouch (2010) have identified the following list of core resources and attractors that define competitive capabilities of destinations:

- Physiography and climate;
- Culture and history;
- Market ties (tourists who travel to the region because of individual reasons, e.g. sports, ethnic ties, etc.);
- Entertainment;
- Tourism superstructure;
- Special events.

The researchers identify special events as 'a wide range of 'happenings' that can create high levels of interest and involvement on the part of both visitors and residents'.

Tara-Lunga (2012) had conducted an extensive analysis of meanings of the word 'event' and synthesized the following meaning of it: 'result, effect as well as that of happening, adding meanings such as:

- Gathering or social activity;
- Something that happens at a given place and time;
- Competition;
- Adventure;
- Occasion.'

A lot of research uses the following definition of special events: 'a celebration or display of some theme to which the public is invited for a limited time only, annually or less frequently' (National Task Force on Tourism Data, 1986). Getz (1989) has also identified the following criteria for such events:

- Open to public;
- Main purpose of such events is celebration or display of some theme;
- Occur yearly or less frequently;

- Have predetermined opening and closing dates;
- Use permanent structures (venues) not owned by the event;
- The programme of such event consists of one or more separate activities;
- All activities take place in the same community or tourist region.

Getz (1989) points out that this definition of special events was 'influenced by… orientation to community-based festivals' and that 'any definition of special events should be designed to meet particular planning needs'. This definition is similar to the one given by Goldblatt (2002): 'a unique moment in time celebrated with ceremony and ritual to satisfy specific needs'.

Matthews (2008) attempts to generalize the definition: 'a gathering of human beings, generally lasting from a few hours to a few days, and designed to celebrate, honor, sell, teach about, or observe human endeavors'.

It can be seen that all definitions are based around the following aspects: time, place, reason and gathering.

Goldblatt and Matthews, both renowned specialists in event management, propose different classifications of special events based on their theme. Below are the 'subfields' of special events identified by Goldblatt (2002):

Table 4 - Special event types (Goldblatt, 2002)

Subfield Name	Definition	Example
Civic Events	Celebration events where everyone is invited to participate	Doo-Dah Parade Mardi Gras
Expositions	Event where suppliers meet potential clients and/or introduce their products	Mobile World Congress Electronic Entertainment Expo
Fairs and Festivals	Public community event symbolized by multiple experiences that find meaning through lives of participants	Religious festivals (e.g. Easter) Music festivals (e.g. Tomorrowland)
Meetings and Conferences	Events that provide networking opportunities for the participants	Krasnoyarsk Economic Forum St. Petersburg International Economic Forum
Retail Events	Promotional events organized to drive attendees and	Live concert at a mall

	increased sales at the venue	
Social Life-Cycle Events	Milestone events that mark the passage of time	Bar-mitzvah Wedding
Sport events	Events that display competing teams or individuals	Football games Ice skating championship
Tourism	Multitude of events supposed to attract tourists to the region	Craft shows Historical reenactments

Matthews (2008), citing these subfields, criticizes this approach and proposes a 'more integrated approach', dividing special events into three subcategories:

- Meetings and conferences;
- Expositions and trade shows;
- Celebrations, ceremonies and spectacles.

The latter category is also divided into public and private events. This framework, however, is intended by the author to aid readers in choosing their career path in event management and also lists according certifications. We should also note that it can be considered as a more general classification of events than the one given by Goldblatt (2002) and therefore less practical to our research, as it is not as deep and informative.

Jago (1997) has developed a definitional framework that aims to classify all event types taking into account their scale:

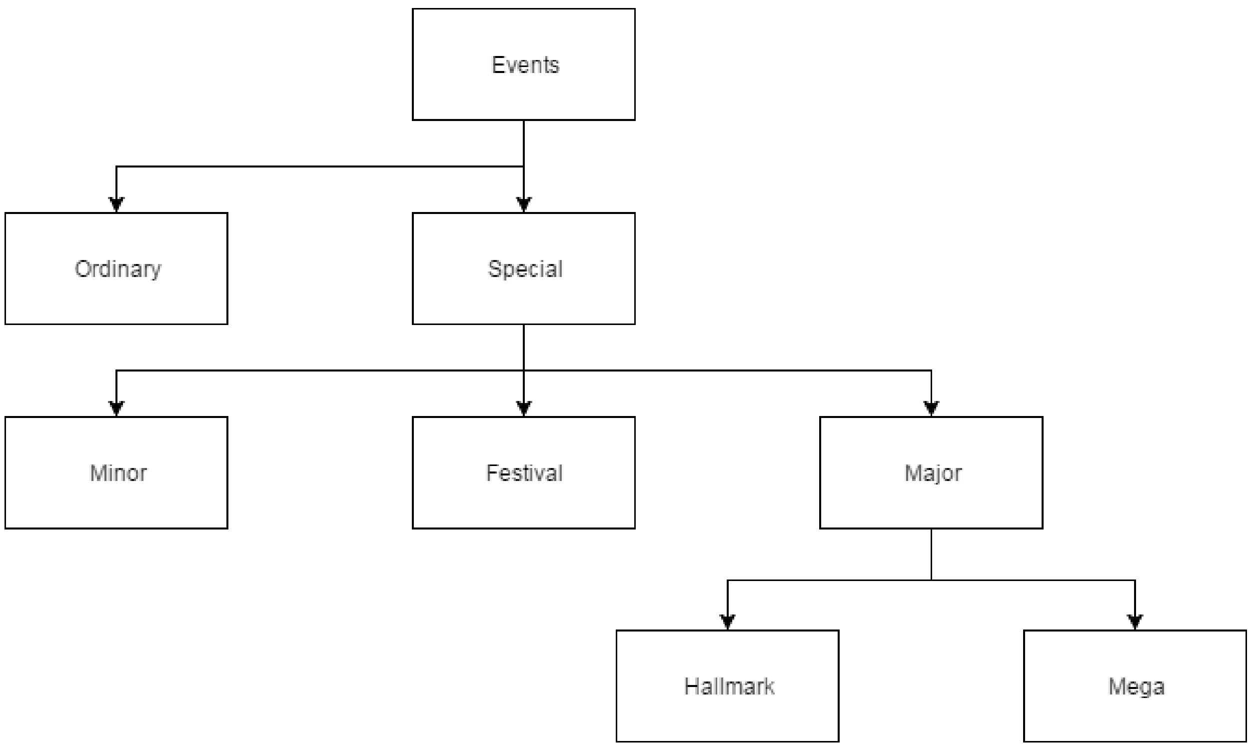

Figure 1 - Event typology (Jago, 1997)

There is, however, still little agreement between event management scholars about the exact scale ranges that refer a particular event to a specific category, e.g. based on the number of attendees (Jago, 1997). For example, average concert attendance in UK in 2012 was about 17,000 people, while sport leagues in Europe and US can attract from 15,000 to 60,000 people (Statista, 2016).

There is also a separate category of 'mega-events' mentioned by Jago (1997) that defines events with attendance from 200,000 people and higher. The Olympic Games and FIFA World Championship belong to this category. Beyond the attendance level, such events are characterized by the destination change for each new event (Matthews, 2008).

Another important category is hallmark events which are associated with a particular territory and are held once a year (typically) or more seldom. An example of such events can be the Tomorrowland music festival which is held annually in the same territory in Belgium.

Getz (1997) has developed a generic model of special events (see Figure 2).

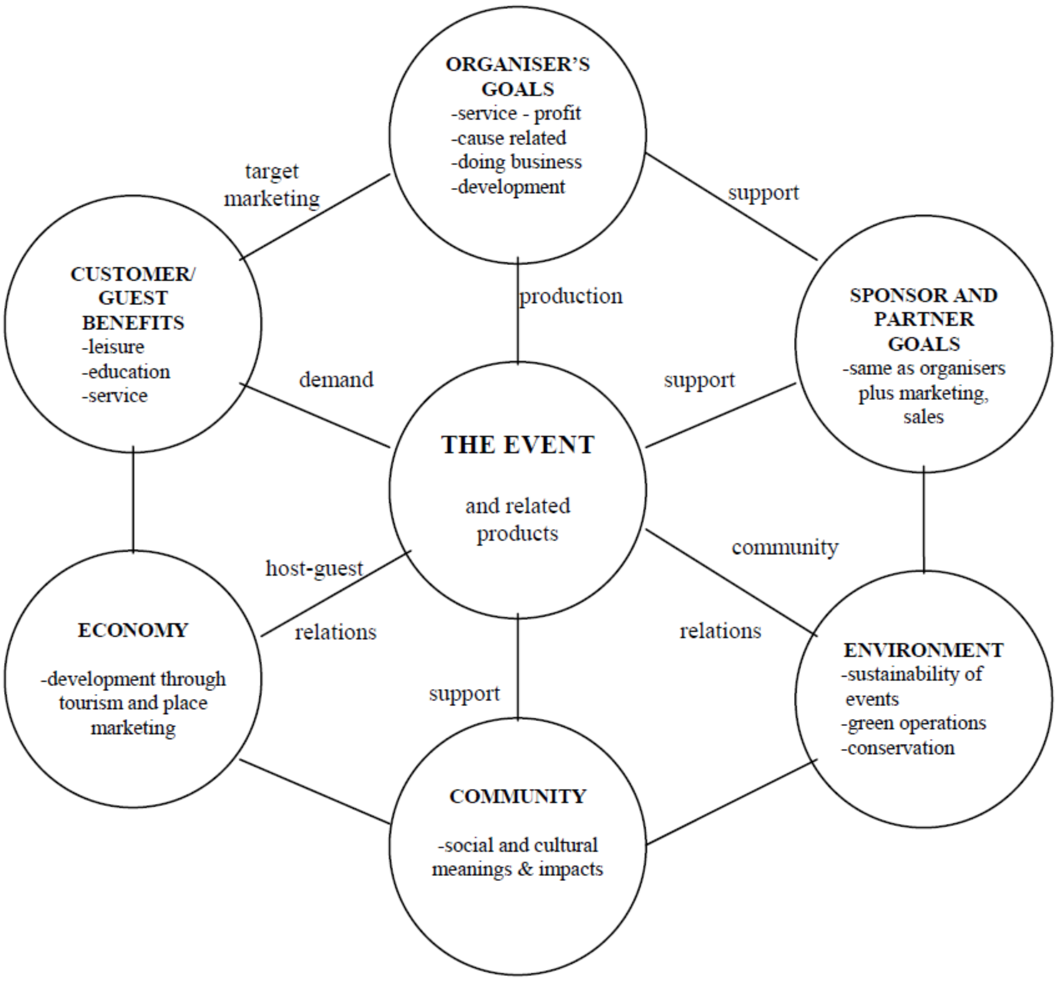

Figure 2 - Special event model (Getz, 1997)

This model brings an understanding of events' place in the environment, their stakeholders and the impact that events have on each of them. Based on it, we can deduct four major event goals: satisfy guests who seek leisure, education or specific service; help event organizers and sponsors achieve their goals, financial, cause-related goals or others; generate value for community and economy through attracting tourists and developing local heritage and culture. Additionally, events must be sustainable and not damage (or, ideally, improve) the environment they are held in.

Hernandez-Mogollon et al. (2014) in their state-of-the-art review of event management synthesize the following set of benefits that holding special events brings to a destination:

- Economic benefits generation by attracting tourists;
- Development of infrastructure and services;
- Creation or strengthening of a brand image for the destination site.

Thus, special events are an important part of economy and community and benefit them on local and global levels.

The companies operating in the event industry are very diverse and it is complicated to give a proper classification to them.

Event industry is focused on providing services (i.e. special events), and Bowdin et al. (2006) suggest a so-called 'event services trinity' (see Figure 3 below).

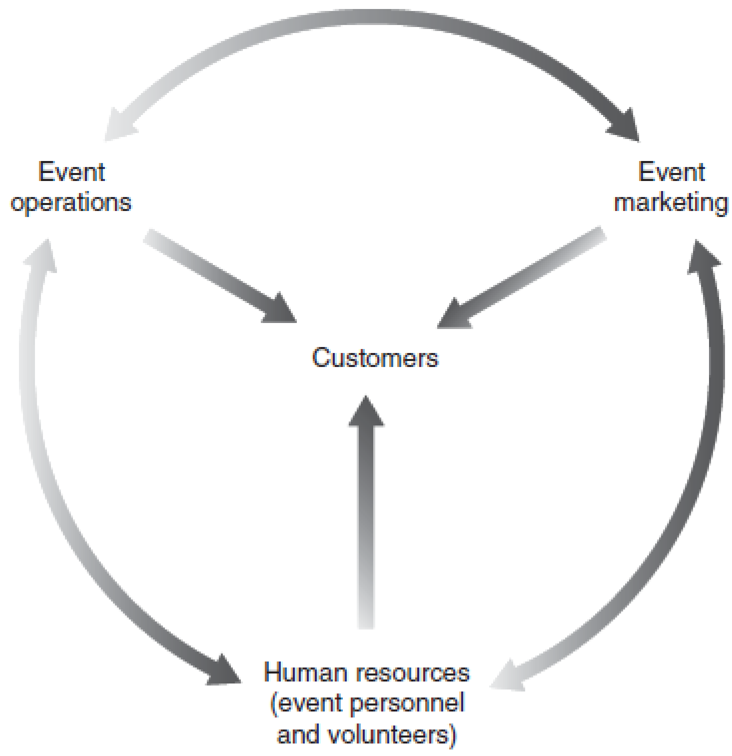

Figure 3 - The event services trinity (Bowdin et al., 2006).

This approach allows an easy categorization of all major activities connected with event management and organization. It is convenient as it does not include generic business processes connected with events company administration and focuses only on industry specifics which is what we are seeking in this research. Further, each part of the trinity will be explained.

The event operations domain contains activities such as ticketing, queuing, site layout, lighting and sound, and all other functions connected with managing tangible assets on the event.

The human resources part manages the personnel and volunteers who work on the particular event. Its task is to provide the necessary skills and expertise for the event and to manage it effectively.

Finally, event marketing is the last part of the trinity which is responsible for event conceptualization and promotion. Its ultimate task is the successful event creation which fosters the achievement of goals set by the event organizers.

At the center of the trinity is the customer. There is a special attribute connected with the event customers which is called attendee experience, the central part of each event. This is what defines the event success or failure (Silvers et al., 2005), so it needs to be examined thoroughly.

The attendee experience domain of event studies has attracted a lot of research. Getz (2007) identifies the event experience as the core factor of every event which is the main reason why people actually attend the described event. He gives three different definitions of 'experience':

- Conative: 'describes actual behavior, the things people do including physical activity'. This definition of experience is synonymic to 'live through' and is often used in daily life.
- Cognitive: involves judgement, learning and understanding and is the key component of experience on business meetings or scientific conference. This definition resembles learning.
- Affective: concerns emotions and feelings, used to describe fun and pleasure from an event. This is the most common way to define experience from concerts of sports.

Matthews (2008) puts great emphasis on special effects, lighting and other aspects of events that add to attendee experience. They are seen as an integral part of festivals and their effect on the affective type of experience is enormous.

On the other side, attendee experience is the final product of the three key event services we have described before (Bowdin et al., 2006), so it is feasible to choose these services as the units of our adoption analysis.

If we want to understand the potential of the Internet of Things in the market from the managerial perspective, we should use Rogers' (2003) diffusion of innovation theory as the cornerstone for building the research concept.

In this theory, innovation is defined as a certain 'idea, practice, or an object perceived as new by an individual or other unit in adoption'. Another key aspect is the communication channel that is the 'means by which messages get from one individual to another'. Finally, the diffusion is defined by Rogers (2003) as 'the process by which an innovation is communicated through certain channels over time among the members of a social system'.

The social system is another important aspect that defines the environment in which an innovation is diffused. Rogers (2003) defines it as 'a set of interrelated units that are engaged in joint problem solving to accomplish a common goal' that has a certain structure and opinion leaders – units influencing others in making innovation decisions. Such social systems may be comprised not only of individual people, but also of organizations: an industry or a market is an example of such social system.

Innovation decisions are an integral part of adoption: this term defines how and who decides whether an innovation must be adopted or not. Three major types of innovation decisions are identified:

1. Optional innovation decisions: each individual in the system decides on his or her own whether an adoption must be made, and the influence of other individuals is limited.
2. Collective innovation decisions: all members of the social system must reach an agreement regarding the adoption, otherwise it would not be made.
3. Authority innovation decisions: decision on adoption is made by a group of individuals, while other members of the social system have no right to participate in the decision making process. The abovementioned group comprises system members who possess the power, expertise, or status that gives them exclusive rights for decision making.

Innovation decision as a process include five stages:

1. Knowledge, when an individual is made aware of the existence of innovation and begins to understand how it works and functions;
2. Persuasion, when a positive or negative attitude to an innovation is formed by an individual;
3. Decision, when the described individual starts to engage in processes and activities that lead to either adoption or rejection of an innovation;
4. Implementation, when an individual who decides to adopt the innovation starts actually using it;

5. Confirmation, when the individual who is using the innovation receives reaction from other members of his/her social system and makes a final decision whether to keep an innovation or refrain from using it.

Another key finding of the theory is the analysis of innovation attributes (as perceived by individuals). Rogers (2003) identifies five of them:

1. Relative advantage: 'the degree to which an innovation is perceived as better than the idea it supersedes'.
2. Compatibility: 'the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters'.
3. Complexity: 'the degree to which an innovation is perceived as difficult to understand, adopt and use'.
4. Trialability: 'the degree to which an innovation may be experimented with on a limited basis', thus reducing the risks of uncertainty when making innovation decisions.
5. Observability: 'the degree to which the results of an innovation are visible by others'.

Finally, Rogers (2003) defines a system of variables that determine the rate of adoption of innovations (see Figure 4).

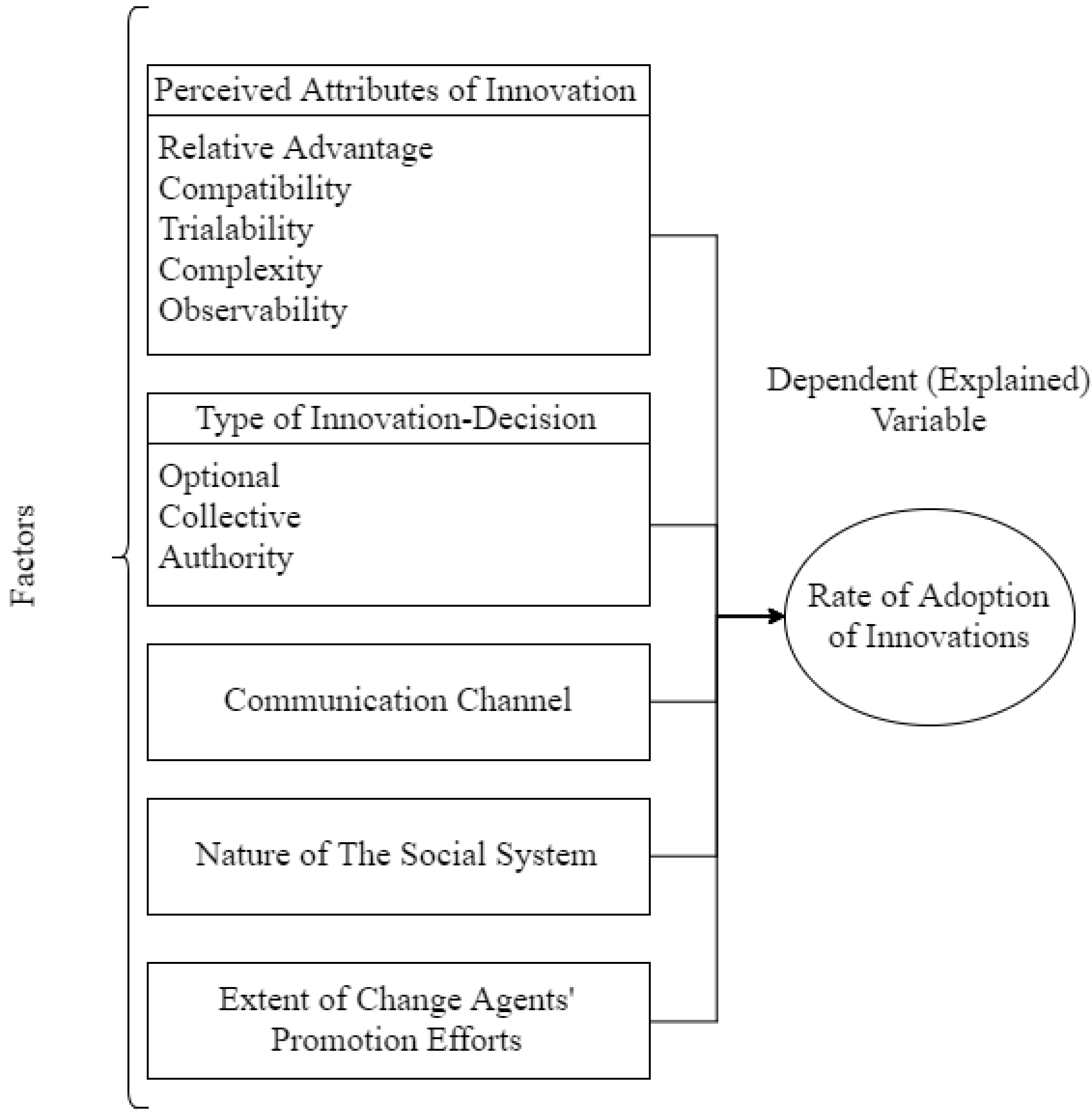

Figure 4 - Variables determining the rate of adoption (Rogers, 2003)

Rogers (2003) has also defined a set of main types of diffusion research:

1. Early check about system's awareness of innovations;
2. Adoption rate study for different innovations in a certain social system;
3. Innovativeness studies;
4. Opinion leadership;
5. Networks of diffusion;
6. Adoption rate in different social systems;
7. Usage of communication channels;
8. Consequences of adoption and use of an innovation.

Wisdom et al. (2014) in their extensive review of existing innovation adoption theories developed a multi-level framework of these theories based on context (Table 5).

Table 5 - Adoption constructs by level of context (Wisdom et al., 2014)

Context	Changes in adoption constructs
External System	External Environment Government Policy and Regulation Social Network Regulation with Financial Incentives
Organization	Absorptive Capacity Leadership and Champion of Innovation Network with Innovation Developers and Consultants Norms, Values, and Cultures Operational Size and Structure Social Climate Social Network (Inter-organizations) Training Readiness and Efforts Traits and Readiness for Change
Innovation	Complexity, Relative Advantage, and Observability Cost-efficacy and Feasibility Evidence and Compatibility Facilitators and Barriers Innovation Fit with Users' Norms and Values Trialability, Relevance, and Ease
Individual	Affiliation with Organizational Culture Attitudes, Motivations, and Readiness towards Quality Improvement and Reward Feedback on Execution and Fidelity Individual Characteristics Managerial Characteristics Social Network (Individual's Personal Network)

Another approach was proposed by Baumgartner & Winkler (2003) who have identified three forces that determine diffusion and performance of a technology: technological prospect, market potential and regulatory environment. This framework was later exploited by a number of studies (Jaffe et al., 2005; Braun and Wield, 1994) and applied by Kim & Kim (2016) in their IoT feasibility study. We have also implemented this approach in our research.

The technological prospect includes the following adoption criteria:

1. Technical practicality: the technology ability to meet enterprise technical requirements, such as compatibility with currently used technologies, scalability to support business' growth, and security. For the Internet of Things, it is still a question whether particular solutions suffice to such demands (Xu et al., 2014).
2. Technical reliability: technologies that are aimed to limit or even eliminate the human factor, as in case of IoT, are to be assessed for their security and reliability with increased attention. The reason is that single, smallest failures in their system can slow down important business processes such technologies aim to ease (Mattern & Floerkemeier, 2010).
3. Cost efficiency: although the IoT concept is supposed to decrease costs for the adopters of the technology (Ahn et al., 2010), the adoption itself is often associated with indirect costs, such as contracting, legal costs for the enterprise, learning and perceptional costs for the users. It is also crucial, of course, that benefits from adoption outweigh the associated costs (Erreev & Patel, 2012).
4. Standardization: although IoT is still in the beginning of its development, standardization of participating technologies is a critical issue, as the concept is aimed to connect technologies, industries and business processes that is hardly possible if there are several different conflicting standards in the market (Bandyupadhyay & Sen, 2011).

The market potential force is split into the following four criteria:

1. Market demands: adoption rates for innovations are at the highest levels when market participants use not only push (scientific development) but also pull strategies, and the latter depends heavily on market demand (Myers & Marquis, 1969). For IoT, this is even more important, as the performance of IoT-based solutions is defined by a number of 'things' connected, and the failure to reach critical mass will result in product being thrown out of the market (Dutton, 2014).
2. User acceptance: the lack of acceptance hinders technology adoption significantly, and to convince users to accept new technology, it must be ensured that the change is perceived as useful and easy (Davis, 1993). The Internet of Things case might be even more complex as it is associated with the decrease of privacy and security of users (Dutton, 2014).
3. Business model: for a technological solution to be successful in the market, it must deliver the sufficient value to customers and satisfy vendor's needs for returns, which requires a clear business model (Chesbrough & Rosenbloom, 2002). Creation of such model is a complicated task in case of Internet of Things due to immaturity of the concept

and high variety of participating technologies and things connected (Westerlund et al., 2014).

4. Ecosystem building: this criterion defines whether a suggested technology can form a basis for a market leader which can group solutions made by other vendors around it and become a standard; ecosystem leaders get enormous benefits from leading the ecosystem and are able to define the strategy of the whole segment (Gueguen & Pellegtin-Boucher, 2004). This factor's significance is especially important given the lack of standardization in Internet of Things mentioned above.

The last force is regulatory environment which includes:

1. Industry regulation: one of the major regulatory challenges for Internet of Things vendors and adopters is the lack of the proper regulatory framework (Bradley et al., 2013). In other words, it is hard to predict the legal response to the technology, which is a serious obstacle for many enterprises. Additionally, Internet of Things is meant to connect different industries where regulation can differ significantly, thus making the situation even more uncertain (Weber, 2011).
2. Consumer protection regulation: as was mentioned before, Internet of Things use is associated with security and privacy threats, thus a regulatory practice has to be established in order to ensure that consumers are protected from such issues (Xu et al., 2014).
3. Governmental support: participation of government in the process of IoT adoption (e.g. by providing tax deductions or grants for adopting enterprises) might boost the adoption rates, especially in the case of our research, where businesses are reluctant to invest in new, unexplored domains (Xu et al., 2014).

Getz (2007) mentions several technological aspects that improve event management practices, in particular, those connected with ticketing and team management.

Emery (2010) in his series of interviews has found out that senior sport managers and local authority hosts name the following factors that will shape the future practice in sport event management: power of mega sports events, emerging needs to better understand cultural sensitivities, development of career opportunities and labor distribution in the industry and the influence of technology. Most respondents argued that it will be technology that will drive the practice of the future, and suggesting a range of possible developments ranging from developments of 3D home television enhancing the quality of watching sports at home to stadium enhancements including vibrating seats and embedded screens.

Researchers often experiment with technology to understand how it can be used to enhance the attendee experience. One notable research was conducted by Veerasawmy and McCarthy (2014) who studied how the experience of football match spectators changed when they saw the visualization of their activity compared to the fans of the rivaling team. The respondents reported that this feature was very engaging when the game's pace was slowing down.

It is not surprising that event organizers are experimenting with new ways of improving attendee experience using modern technology. There are several prominent examples of already implemented solutions that use the Internet of Things concept.

The Canada-based Pixmob company provides clients with wearables for their events that serve as tickets and have a powerful LED light embedded. The latter feature allows event organizers to improve lighting and even make it dynamic, letting the performers improvise with synchronized lighting. This technology is used by Taylor Swift on her world tours.

Disneyland in Orlando uses Magic Bands – wearables that, again, perform ticketing functions and let attendees pay for their purchases on-site using the NFC chip in the wristband.

The US startup Cantora is developing several high-tech applications for the music industry, one of them being Nada wristband. The product is still not released but the producer promises that it will let event organizers track user behavior at the event.

Finally, Sendrato is a Dutch company that already has the most advanced solution in the market. Sendrato wristband has functions of a ticket, LED lighting, a 'social' button (lets user interact with the event online, e.g. 'like' the event page on Facebook) and a pairing function that helps attendees meet new friends. It is used at Tomorrowland electronic music festival with attendance rates over 100,000 people.

Table 6 - Comparison of existing successfully implemented IoT solutions in event management

Vendor Name	Ticket	LED Lighting	Social functions	Release Status	Users
Pixmob	+	+		Released	Taylor Swift
Disney Magic Band	+			Released	Disneyland
Cantora Nada	+			Not released	Not known
Sendrato	+	+	+	Released	Tomorrowland

1.3. Research Gap

Focusing first on applying Internet of Things to enhance attendee experience on events, we have soon found out that understanding the potential of IoT application inside event industry would allow us to analyze the industry better and generate more valuable insights, and ultimately would help industry stakeholders see the picture in general and make better adoption decisions. There are multitude of studies that experiment with new applications of Internet of Things for various types of events, from football matches (Veerasawmy & McCarthy, 2014) to dance performances (Barkhuus et al., 2014) and they all are trying to work out specific designs for particular event type. One of the explanations to this situation could be that IoT concept is still not mature enough, especially in industries which remain mostly uncharted to this date, as in the case of event industry.

On the other hand, it turned out that event organization is a much more complex process than it seemed in the start, and that IoT might be applicable in some other areas of this industry. The literature studied did not return satisfactory proofs of denials of this hypothesis. In particular, the adoption potential and the factors affecting diffusion and performance of the Internet of Things in event industry have not been researched yet. Studying these topics is very likely to reveal the adoption prospects, together with the plan of action for businesses to boost their performance using the Internet of Things solutions.

This is why we decided to use a different approach, inspired by Kim & Kim (2016), who were trying to create a basis for further research of applying IoT in certain industries in a particular region (South Korea). For this research, we have used similar logic: to activate the events market for the Internet of Things, first a general view is needed, as some aspects of the industry (other than attendee affective experience) could remain in the dark and expert interviews could shed light on them.

We believe that this approach fits our research goal much better, since it allows us to stay in the limits of innovation management science and is aimed to fill the important research gap, with the ultimate goal of helping event companies and technology vendors to interact more efficiently.

2 METHODOLOGY

2.1. Research Approach

To achieve our goal and formulate recommendations for stakeholders that can actually be used in practice, a set of data regarding adoption factors and their evaluation is needed.

Saunders et al. (2015) propose an extensive and widely used framework for student business research called 'the research onion' (see Figure 5).

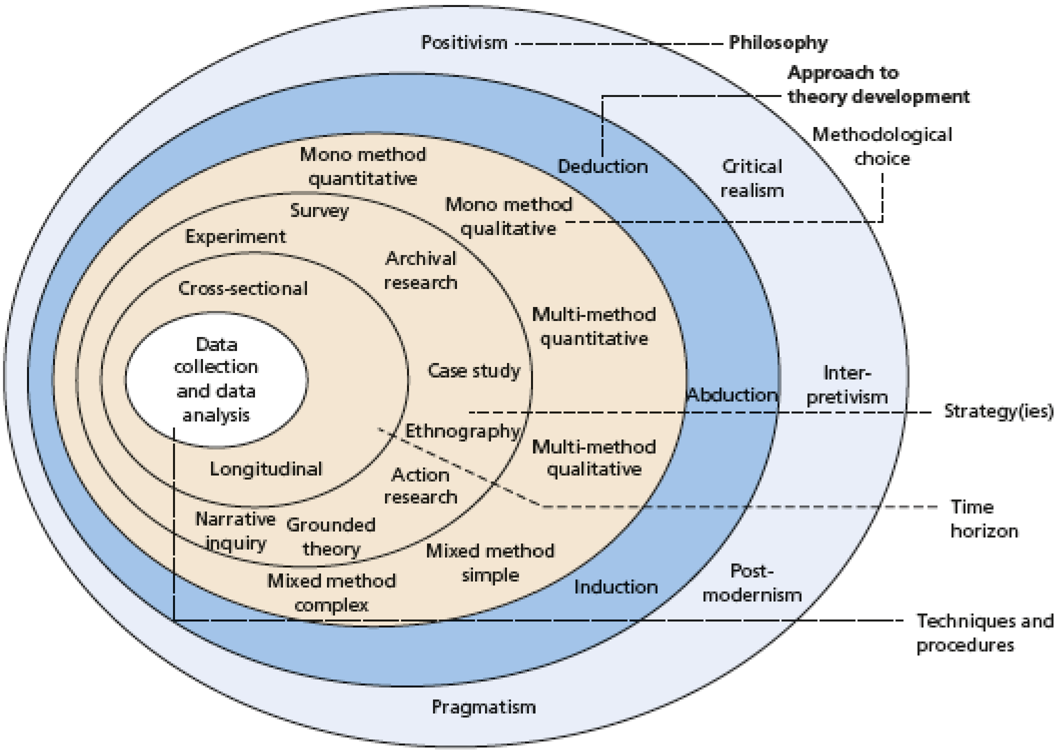

Figure 5 - The research onion (Saunders et al., 2015)

This technique defines six key characteristics of a research: philosophy, approach to theory development, methodological choice, strategy, time horizon and techniques and procedures. We will describe choices made on steps 3-6.

We will start from the methodological choice step, where the decision is made whether qualitative or quantitative data is to be used.

The search for secondary data regarding adoption of IoT in enterprises did not return any results, as it was explained in the first chapter of the research. There are several reviews of currently used technologies and trends in the non-scientific literature about event management (e.g. GEVME, 2016) but scholars have not studied event industry for IoT adoption potential deeply yet.

Saunders et al. (2015) consider two approaches for data collection: quantitative and qualitative. They define quantitative techniques as data collection techniques that 'generate or use a numerical data', and qualitative techniques as those that exploit non-numerical data, such as words, images, etc.

The authors, however, argue that this distinction is 'both problematic and narrow', because in reality most research cases made in business and management areas are very likely to combine both methods, therefore mono-method research is a rare practice. Thus, mixed research methods are often used.

In our case, however, we have used qualitative methods only, due to the high uncertainty of the research environment where an immature technology's potential is evaluated in the context of the event management industry and where only little practice of application for this technology exists. It is therefore complicated to create the right research framework to generate reliable quantitative data.

The next step of formulating the research design is identifying the research strategy to be used. Saunders et al. (2015) identify the following types of research strategies: experiment, survey, archival/documentary, case study, ethnography, action, grounded theory and narrative.

For the purposes of our research, we have used the survey strategy to make a snapshot of expert knowledge, as this strategy is fast, efficient and allows for extracting and understanding valuable insights.

There are two types of research time horizons: cross-sectional (studying a certain phenomenon or phenomena in a certain moment of time to develop a snapshot understanding of a current situation) and longitudinal (studying a phenomenon or phenomena or during a long period of time to observe change and development). We chose the cross-sectional time horizon due to high speed of IoT technologies development that requires rapid observation methods to generate practically valuable implications.

The final step in building the research framework is defining the exact tools and methods to use in the study. For our purpose, we have used one of multi-criteria decision making models – Weighted Sum Model, together with expert judgment elicitation techniques.

2.2. Weighted Sum Model

According to the problem this research is trying to solve (finding the best alternative for IoT integration in event management services), and the means we are using (5 expert interviews), we have referred to the multi-criteria decision making domain.

Decision making in any group can take either the consensus or conflict form. In the first case, the final decision is reached when all or most members of a group (who have equal positions) agree on one of the options given. In case of conflict decisions, some members of a group have more influence than others and can lobby certain decisions.

Multi-criteria decision making is a group of methods aimed to 'evaluate a set of alternatives in terms of a number of a criteria' (Triantaphyllou, 2013), thus reducing uncertainty when making important decisions in business, engineering, risk management and many other domains. These methods can be split into several groups based on the information available to the researcher and data generated during the process; a taxonomy of MCDM methods can be found below.

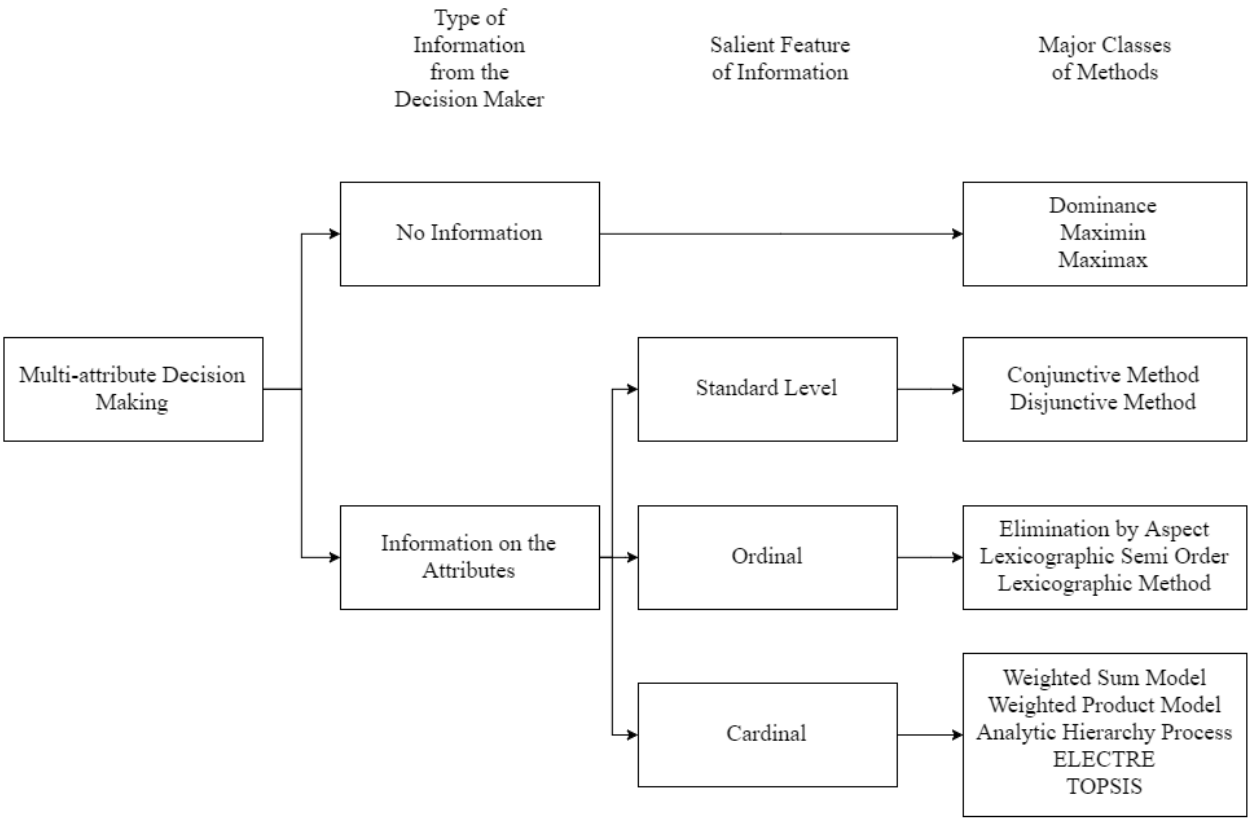

Figure 6 - Taxonomy of multi-criteria decision making methods (Chen et al., 1992)

Speaking in terms of the described taxonomy, we have information on the attributes (11 technology adoption factors described in our literature review); we also want to use cardinal (unranked) scores to simplify expert judgment process. Using ordinal methods is not appropriate in our case since neither we nor experts have a full understanding of relative importance of each of factors evaluated.

According to the factors abovementioned, we decided to start a search for experts in order to model a decision making process for technology adoption. For the aggregation of expert opinions the weighted sum model was chosen.

All cardinal methods using expert judgment share the same principle in their basis: different experts give their judgments about a set of evaluation criteria which are then used to rank several alternatives.

Assume that there are the following given parameters: n alternatives, p experts and m decision criteria. A_i and C_j, (i = [1, 2, …, n], j = [1, 2, …, m]) are the sets of alternatives and criteria, respectively. Let x_{ij}^k be the opinion of k-th expert about j-th criterion applied to i-th alternative. Therefore, a total evaluation score of an alternative i can be calculated using the following formula:

$$S_i = \sum_{k=1}^{p} a_{ik} w_k ,$$

where w_k is a weight of a given expert;

$a_{ik} = \sum_{j=1}^{m} x_{ij}^k u_j^k$ (u_j^k is weight given by expert k to criteria j).

Weighting experts and criteria is obviously of extreme importance; however, it is not always appropriate. Ramanathan & Ganesh (1994) described a ‘supra-decision maker’ approach to expert importance weighting, where one person has the ultimate power of assigning weights to different experts; however, this requires that this person has a certain status recognized by all other experts and the necessary qualifications.

Other approaches suggest comparing experts in terms of their relevant experience, including formal education, citation indices and similar parameters (e Costa & Oliveira, 2012).

We can use neither of these approaches: all experts selected have very different experience and there is no single person who could do the evaluation of others. In this situation, Ramathan & Ganesh (1994) suggest using equal weighting for each expert to minimize the potential bias.

Our another concern was about weighting the criteria (performed by the experts); however, after our first interview we chose to deny this approach and using equal weights as well, since the criteria are rather inconsistent and therefore hard to rank. Another reason for this was uncertainty in criteria importance (which this research is actually aimed to reduce).

However, using simple means is generally not recommended in the literature when interviewing small numbers of experts. Instead, it is suggested (Meyer & Booker, 2001) to use a median score for a criteria from all five experts.

Thus, a median score for each criteria against each alternative is then weighted (or normalized) for a criteria and the sum of scores is calculated for each alternative, according to the Weighted Sum Method (Triantaphyllou, 2013).

First, a matrix with expert opinions is built for each alternative:

Table 7 – Expert opinions' initial matrix

	Expert 1	Expert 2	…	Expert n
Criterion 1	x_{i1}^{1}	x_{i1}^{2}	…	x_{i1}^{n}
Criterion 2	x_{i2}^{1}	x_{i2}^{2}	…	x_{i2}^{n}
…	…	…	…	…
Criterion J	x_{ij}^{1}	x_{ij}^{2}	…	x_{ij}^{n}

Then, expert opinions are combined into medians for each criterion against each alternative and the resulting matrix is formulated:

Table 8 – Median opinion matrix

	Alternative 1	Alternative 2	…	Alternative i
Criterion 1	$\tilde{x}_{11}$	$\tilde{x}_{12}$	…	$\tilde{x}_{1i}$
Criterion 2	$\tilde{x}_{21}$	$\tilde{x}_{22}$	…	$\tilde{x}_{2i}$
…	…	…	…	…
Criterion J	$\tilde{x}_{j1}$	$\tilde{x}_{j2}$	…	$\tilde{x}_{ji}$

Finally, medians are weighted for each criterion and the total scores are calculated and ranked for each alternative:

Table 9 – Weighted opinion matrix

	Alternative 1	Alternative 2	…	Alternative i
Criterion 1	ω_{11}	ω_{12}	…	ω_{1i}
Criterion 2	ω_{21}	ω_{22}	…	ω_{2i}
…	…	…	…	…
Criterion J	ω_{j1}	ω_{j2}	…	ω_{ji}

In Table 9, $\omega_{ij} = \frac{x^{\sim}_{ij}}{\sum_{1}^{j} x^{\sim}_{ij}}$.

After this alternatives are being ranked according to the resulting sum of scores:

$$\sum ¿ \sum_{1}^{j} \omega_{ij} ,$$

and all alternatives are ranked according to the resulting sum scores.

2.3. Expert Sampling

The factors chosen and their explanation are given in the Table 8 below.

Table 10 - Survey framework

Technique Factor	Our Choice	Argumentation
Technique	Expert Judgement	High uncertainty and forecasting nature of the research
Expert Occupations	Arena Managers	Arena managers deal with a lot of different kinds of events and manage innovative event technologies at the same time
	Event Industry CTOs	These specialists are responsible for innovation in event companies and should have huge expertise about all kinds of applicable technologies
	Technology Vendor Employees	These experts have an expertise in providing already working solutions for event industry
Sample Size	9	Recommended size is 5-9; There are limitations in our research connected with low diffusion or IoT in Russia, so experts with relevant experience are harder to reach
Elicitational Situation	Individual Interviews	Low availability of experts, geographical distance, different expertise
Motivation Methods	Intrinsic Aspect of Research Expertise Recognition	Lack of financial resources, innovative nature of the research

Based on the research framework developed and our own limitations, we have also formulated the following requirements for the research technique:

- The experts must work in arenas with capability of more than 5000 people, event management companies that run events involving more than 5000 people or technology vendors that have launched commercial IoT solutions for event management;
- The interview should be conducted via Skype or other Internet-based voice communication service to ensure stability and prevent both parties from having any communication costs;
- Interviews should not be longer than 1 hour;
- All interviewees must be asked if they want to keep their identity anonymous in the research;
- All interviewees are sent a Google form after the interview in which they quantify their evaluations to confirm interview results.

Considering all abovementioned factors, we have defined the following company population which we contacted to request expert interviews:

Table 11 – Experts asked for cooperation

Category	Organization
Arena Managers	Saku Arena (Tallinn), Tauron Arena (Krakow), Palau Sant Jordi (Barcelona), Ahoy Arena (Rotterdam), Globe Arenas (Stockholm), Mercedez-Benz Arena (Berlin), O2 Arena (London), Hartwall Arena (Helsinki), Siemens Arena (Vilnius), O2 Czech (Prague), European Arenas Association
Technology Vendors	Sendrato, Pixmob, Nada, IBM, Cisco, AGT International
Event Management Companies	IMG Group, SFX Entertainment

During the interview the experts are asked to evaluate the adoption factor of IoT against each part of the event services trinity (all those factors were found in the literature review part of the research) and justify their opinion; thus a discussion is started where expert can express his position on these aspects freely. The simplified scheme is presented on Figure 7 below and the detailed structure is located in Appendix A.

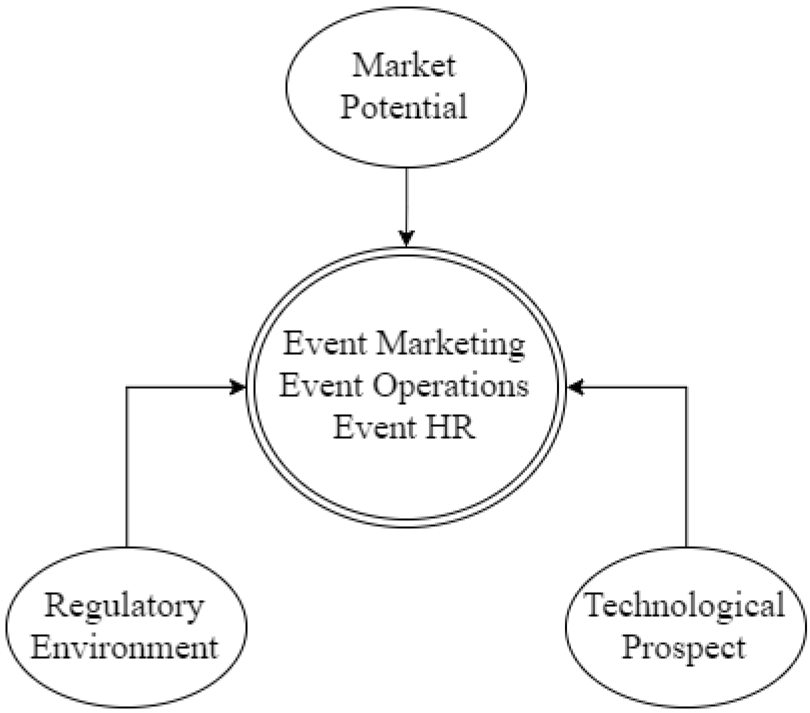

Figure 7 - Survey structure

We also realized that our interviews are also an excellent opportunity to generalize experts' opinion about the technology, so we added additional questions to learn the following data from respondents:

- Examples of other IoT solutions used in event industry;
- Interest for IoT adoption in event industry in general;
- Other adoption factors not included in the framework;
- Priority areas for respondent's company;
- General level of IoT potential for event industry and future forecasts.

This is why we have chosen to use the convenience sampling technique. We have selected those experts who:

- Could be reached and agreed to have an interview;
- Had an experience or at least understanding with IoT applications;
- Work in or develop technology solutions for event industry.

We have used the following sources for finding and contacting experts:

- Own contacts (10 people);
- European Arenas Association list of members (13 arena employees);
- National Arenas Association (USA, NAA inbox);
- Technology companies that develop relevant solutions (4 companies).

The initial contacting phase returned 5 replies. We have worked further with these experts only. Below is the list of experts to whom we will refer as Expert 1-5 to ensure anonymity.

The sample building was defined mostly by our limitations, i.e. the time frame of the research and a considerably low amount of experts with actual experience in this field.

Table 12 – Expert profiles

	Group	Occupation	Location	Expertise
Expert 1	Event Management	Marketing Manager	Europe	Investigated opportunities for IoT implementation
Expert 2	Technology Companies	Data Analyst	Europe	Participated in an IoT project for an event management company
Expert 3	Technology Companies	Marketing Director	North America	Responsible for marketing of an IoT for Events solution
Expert 4	Arenas	Marketing Specialist	Europe	Worked with several IoT-enabled events
Expert 5	Event Management	Independent consultant, blog writer	North America	Consulted event management companies about IoT implementation

2.4. Expert Interviews

Expert judgement is ‘data given by an expert in response to a technical problem’. An expert is a person with a considerable background in subject area who is recognized by the researchers or by expert’s peers as qualified enough to provide answer to researcher’s questions in an interview or a questionnaire. This method is used in cases when research questions cannot be answered by other, more reliable means (Meyer & Booker, 1991).

Expert judgement is used to generate information 'when other sources, such as measurements, observations, experimentation, or simulation, are unavailable' (Meyer & Booker, 1991). The authors also argue that this method can be applied in conditions when data is 'sparse, questionable, or only indirectly applicable' (Meyer & Booker, 1991).

There are several specific cases where using expert judgment method is advised in research explicitly, e.g. when estimates on complex, rare, new, or otherwise poorly understood phenomena are needed, (Krupka et al., 1983) or when there is need for forecasting future events (Ascher, 1978). This justifies our method selection.

The process of gathering expert judgement is called elicitation and is conducted using methods of verbal or written communication designed for the research.

Elicitation is affected by a multitude of factors, with the most notorious being difficulty of problem preparation, type of information provided by the experts and time frames that experts have (e.g. interview duration) (Meyer & Booker, 1991).

There three basic elicitation situations exist: individual interviews, group interviews or Delphi situations (a group of experts is gathered and their answers are randomized and re-evaluated to enhance validity) (Green et al., 2007). We are using the individual interview method.

There are also some other notable considerations that require researcher's attention when sampling and interviewing experts.

Seaver (1976) suggests that diversity of experts participating in research provides the better quality of answers, as diverse experts are prone to viewing and solving problems in different manners and therefore allow the researcher to consider different viewpoints. This view is supported by Ascher (1978) who argues that diverse expert samples lead to the most up-to-date view on the problem while requiring little resources compared to other researching strategies. Tversky & Kahneman (1974) also admit that such strategy minimizes the impact of a single individual on the overall result of the sample.

Meyer et al. (1991) state that the size of the sample for expert judgement method can vary highly. Generally, it is advised to use sample sizes 5 or above, as having less reduces chances that adequate diversity will be provided and, therefore, that significant inferences can be made. For individual interviews, the researchers recommend interviewing 5-9 experts.

They also argue that analysis of expert data should begin from defining the following key features:

- Granularity: 'the level of detail defined or chosen for the data, the analysis, and the conclusions'. The authors describe an example where the problem solving process could return data in form of ‘detailed steps, equations, <…> and descriptions’ or in form of general categorization given by a pessimistic expert.

- Conditionality: the extent to which the data generated in the interview is affected by external factors (expert’s motivation, mood, environment of the interview, connection quality, or information available and so on).

Granularity can be altered by changing the response mode and documentation recording procedures. Conditionality is harder to achieve in small sample studies where no quantitative analysis is used as it requires multi-method analysis of data. We have designed this research with these two criteria in mind.

One key point of the expert judgment method is expert motivation. Gorden (1980) suggests that the researcher must consider maximizing factors that motivate experts to participate in the interview and minimize those that prevent this. Meyer et al. (1991) provide examples of such factors:

Table 13 – Factors of expert motivation/demotivation (Meyer et al., 1991)

Motivating factors	Demotivating factors
Opportunity to affect the research project	High time consumption (more than 1 hour)
Opportunity to contribute to the knowledge domain	Bad research design
Opportunity to receive recognition	Low researcher status
Money compensation paid	

The literature on this topic has developed two approaches for motivating experts: through pay and through communication of the intrinsic aspects of the project (Meyer et al., 1991). Due to limitations of this student research we will consider only the second option and explain it thoroughly below.

Stroud (1981) puts specific emphasis on the communication of the intrinsic values of the research, thus giving increased attention to the researcher-expert communication process. He suggests that the experts would like to get the information regarding the project in the following order of importance: the reason for the contact, researchers and research sponsors, time and effort required, reason for selection, detailed task explanation, anonymity and anticipated result.

Regarding the questions formulation, Meyer & Booker (1991) describe a three-step formulation procedure which we have followed (see Table 14):

Table 14 – Interview questions formulation procedure (Meyer & Booker, 1991)

Formulation Step	Outcome
Define project's purpose and goals	Purpose: understand how the event industry estimates the potential for IoT adoption Goals: develop an understanding of which IoT characteristics would facilitate or slow down the adoption process
Selecting the general question areas	Area 1: Potential for IoT integration in event marketing Area 2: Potential for IoT integration in event operations Area 3: Potential for IoT integration in event HR management Area 4: general view on IoT integration in event management Area 5: current practices of adoption
Questions defining	For each event service: which factors do you see as potential or current drivers of IoT adoption? Which could be barriers?

We have chosen the factors listed by Baumgartner & Winkler (2003) that were mentioned in the Part I of this study: technological prospect, market potential and regulatory environment. Experts, therefore, are to match these adoption factors with the existing event services, choose drivers and barriers and explain their choice.

There are, however, other factors that have to be taken into account when defining an interview scenario that were mentioned before.

Below is the list of changes and amendments implemented to the scenario based on these recommendations from the methodological literature:

1. The scenario is designed with 1 hour interview duration goal in mind;
2. Experts are approached based on their experience level and merits, and are invited to bring their expertise and express their thoughts on the topic to increase their motivation;
3. Experts have an opportunity to go beyond the limits of specified criteria measured in the interview by suggesting their own criteria of measuring adoption potential;
4. Findings are generalized during the course of interview and after the interview (each expert is asked to fill in a Google form);
5. All experts are provided anonymity (with a brief reference to the expert category and location) and have access to the research when it is finished.

Additionally, we have conducted a test interview with one expert which had shown that it is necessary to find out whether the expert is actually familiar with Internet of Things and its applications in event management before proceeding to the interview stage.

The resulting interview scenario can be found in the Appendix A of this research.

3 RESEARCH FINDINGS

3.1. Interview Results

We have managed to interview 5 experts whose profiles were given in the previous part of this research. All interviews were conducted via Skype on preliminary agreed times. Each expert was interviewed individually.

Graphs below represent the data provided by experts in the interview.

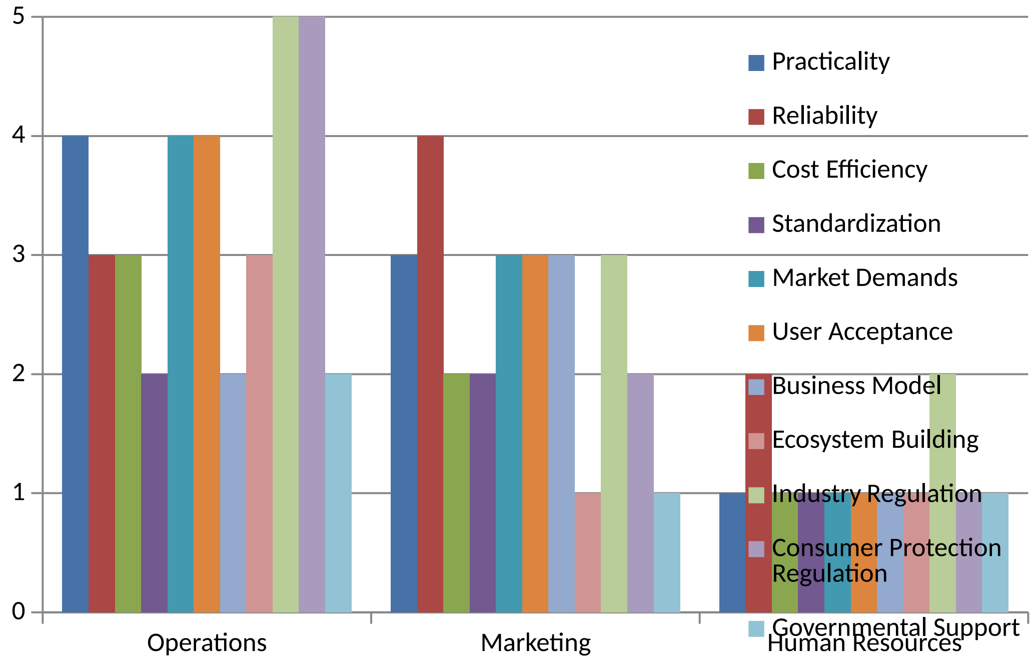

Figure 8 - Expert 1 scores

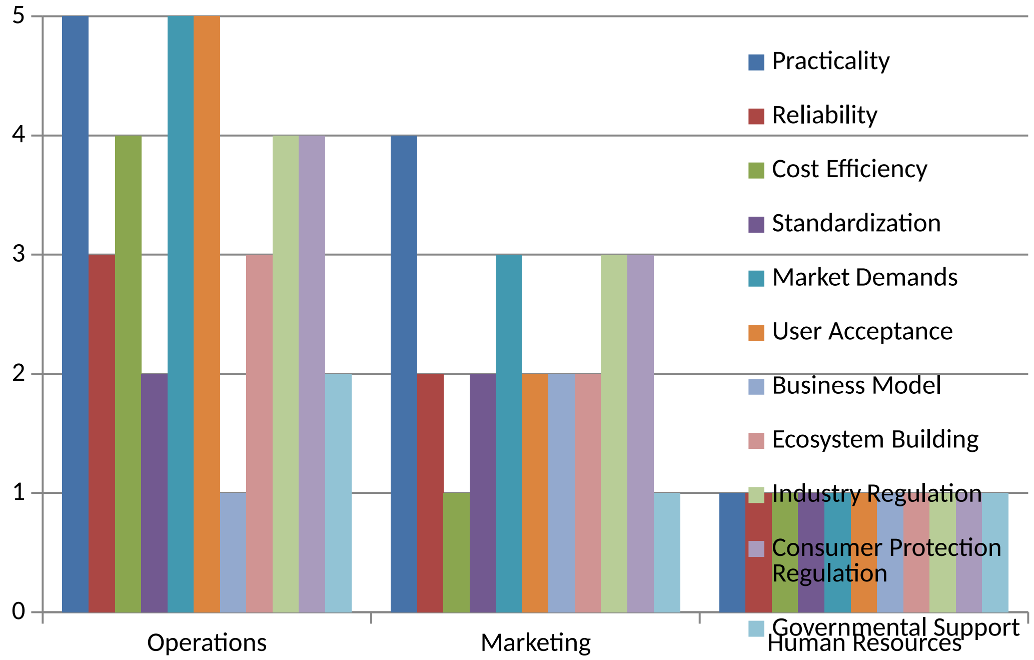

Figure 9 - Expert 2 scores.

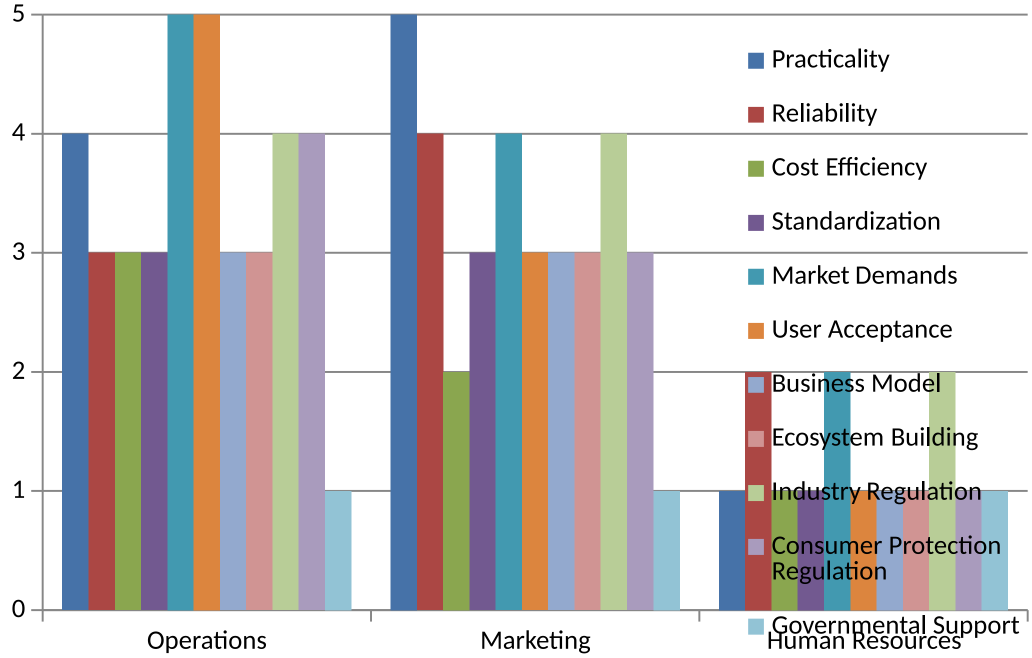

Figure 10 - Expert 3 scores.

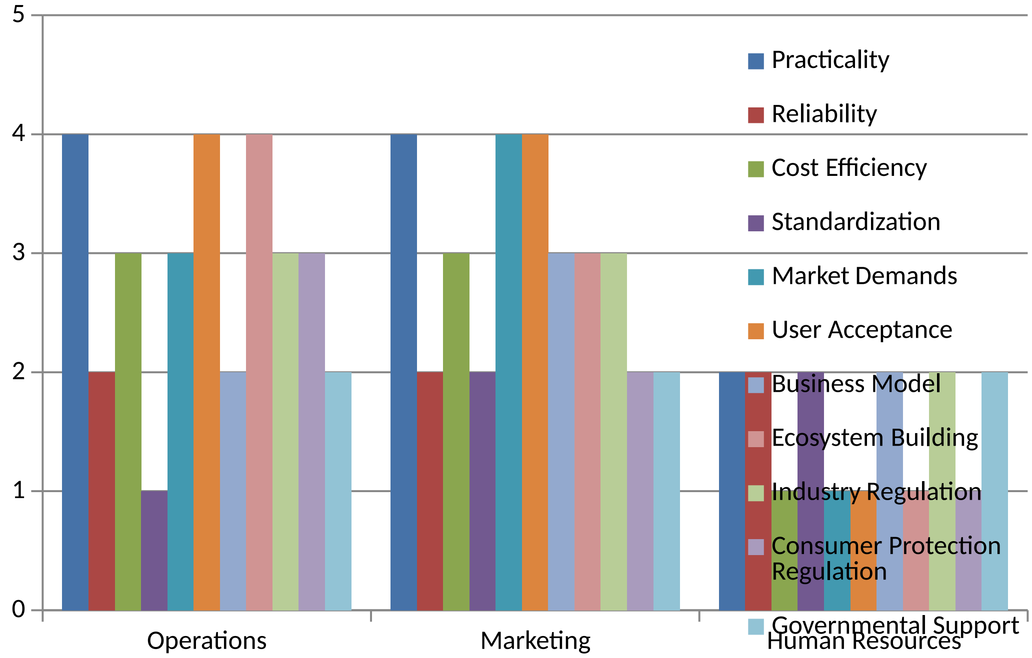

Figure 11 - Expert 4 scores

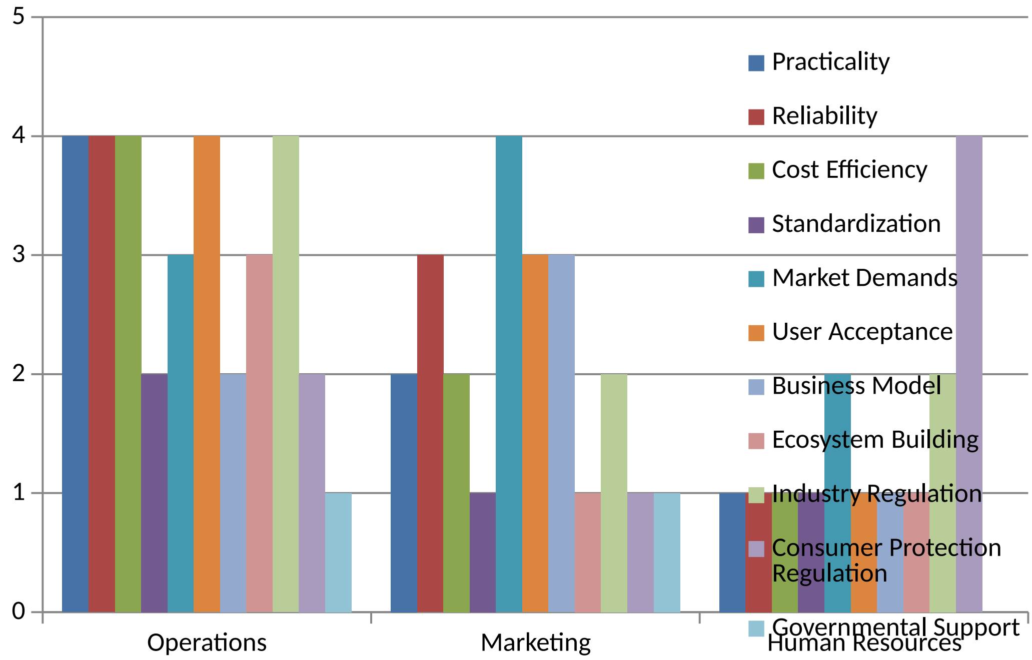

Figure 12 - Expert 5 scores

The interview with Expert 1 was a set-up interview for the whole project, where we discussed various aspects of event management and its services identified in the literature to understand how they should be assessed in our research and what is the current, up-to-date situation like in the industry.

Expert 1 (marketing management from event management sphere) informed us that she had been evaluating opportunities for IoT integration in business and was discussing this with various departments in the company.

She was very eager about the potential for adoption of Internet of Things solutions in operations. Although it was not the function she was dealing with on a regular basis, she communicated with the departments responsible for operations quite often on various projects. She informed us that event operations and logistics is crucial for event management, as these functions involve frequent transfer of valuable, fragile and often bulky equipment from location to location together with required service and storage. Another important function is transfer of people (performers, sportspeople, personnel). Finally, a lot of operational work is done on-site, which requires hiring local personnel or adopting to the local infrastructure, and both ways are complicated.

Regarding the Internet of Things adoption potential for operations, the expert valued both industry and consumer protection regulation in this field very high, giving them the top score. She gave us an example of promising technology solution – Fedex SenseAware and said that there are little obstacles that could hinder the adoption and integration of such technologies in terms of regulation, at least in North America and Europe.

The expert confirmed that the company did not investigate government aid programs but she knows that there are different public-private initiatives concerning adoption of Smart City and Internet of Things technologies and that some level of support is certainly present, but expressed concerns about investing in business projects.

The expert's opinion about the technological prospect of Internet of Things expressed her belief in high technical practicality of such solutions. She, again, referred to Fedex example and mentioned that using such solutions could increase the operation department's awareness about the objects en route. However, the expert was unsure about technical reliability and cost efficiency of such solutions, expressing the need in decreasing costs of using them and improving fail-safe practices. It was also mentioned that there was a lack of standardization of IoT technologies which could hinder the adoption significantly.

Finally, speaking about the market potential of such technologies, Expert 1 said that new, disruptive technologies in operations are very likely to be accepted by the users and are actually demanded by the market, although there was no clear business model of their usage yet. She also informed us that adoption of such technologies relies more on logistics providers, but they would adopt them if clients, in particular event marketing companies, would accept this.

In the marketing section of the research, the expert was a bit unsure about how IoT solutions could actually be used in this sphere. She approved the examples of behavior and location tracking of smartphone users, and confirmed that the company was looking into this market and was negotiating integration of such solutions with several technology vendors, seeing potential in it.

Expert 1 praised the amount and reliability of data that could be potentially gathered using such technologies, but was concerned about how this data could be actually put into practice. The proposed solution to overcome this problem was using specialists in data analysis to disseminate gathered information and return valuable insights. This, however, would decrease potential cost efficiency, at least in the nearest future, according to expert's opinion.

Regarding the market potential of IoT solutions for marketing in event management, expert mentioned that it can be considered high but still largely unexpressed and unrealized due to the general immaturity of the technology. She also argued that creating an appropriate business model for marketing IoT solutions should not be a problem as there are several functioning platforms in the market. The example mentioned was Salesforce IoT cloud which enabled companies using Salesforce platform to gather data from their customers' devices and analyze it in the cloud.

In terms of regulatory environment, the industrial regulation was developed as well as online marketing was present in the market for a considerable amount of time, and there was little difference in principles of online and IoT marketing solutions. However, security and privacy of individual users who are generally the objects of such marketing are a huge concern, according to Expert 1. She mentioned that even if now it is not a huge problem, it is not yet clear how online or IoT marketing regulation in terms of consumer protection could change in the near future what creates a certain degree of uncertainty. Expert 1 was also sure that there was no governmental support for developers or adopters of such solutions, except for startup companies developing them.

We also had a brief discussion about specifics of event human resources management. Two key points here that make it different from other industries are that personnel is often recruited on-site and includes volunteers helping official staff.

Expert 1 had expressed careful interest in using such technologies, but suggested that it is a matter of more distant future as there was currently a number of problems to solve and more prominent industries to come in with IoT solutions, such as marketing.

The expert said that reliability of prospective solutions might be enough for early implementation, but such solutions actually lack practicality and demand in event management.

Overall, expert identified the following adoption factors as key drivers of adoption: technical practicality, technical reliability and market demands. She also had identified a set of barriers: lack of proper, reliable business models, lack of standardization of solutions and questionable cost efficiency.

Expert 1 suggested that adoption in the industry should begin from the most prominent service domain (which she thinks is event operations) and diffuse to other services when tested and optimized. She suggested that first commercially successful adoption might take place in the following 5-7 years.

Based on the interview and feedback from Expert 1, we optimized the interview scenario, adding generalizing questions and a follow-up form that helped quantifying the scores experts gave in interviews.

Expert 2 was optimistic about both operations and marketing potential of IoT. He has pointed out that IoT is used for these applications outside of event industry for quite a long time already and were adopted by leading companies, e.g. Fedex. He, however, expressed concerns about cost efficiency of such solutions, arguing that the scalability of such solutions is limited due to their high cost. He also questioned the reliability of IoT solutions for operations, saying that such technologies yet have to mature enough to be adopted on B2B level, and event industry is not an exclusion. This expert also mentioned that it is questionable whether a successful business model could be built around IoT solutions in marketing or operations, and mentioned uncertainty of the regulation as one of the key factors for this.

Prospects of marketing applications of IoT were not very promising as of now for Expert 2: he claimed that implementing the technology in this domain would require huge amounts of investments while the reliability of marketing data generated is not guaranteed on the current level of development.

Regarding the HR field, Expert 2 said that there are certainly some opportunities to invest but they are not open yet since the currently existing solutions dramatically lack practicality, reliability and cost efficiency and this tendency is unlikely to change in the nearest future.

Expert 3 praised the same benefits of IoT for event operations, primarily ticketing and logistics. He, however, also expressed concerns about cost efficiency of IoT solutions, as Expert 2 did, but also had a counterargument that event logistics often requires sophisticated modes of transportation due to fragility or other specific characteristics of items transported. He noticed that such solutions should ideally work as 'on-demand' products, as the operations that event companies perform are often irregular, geographically diverse and require a lot of adjustments to a particular event.

He was less optimistic about marketing applications of IoT, however, grounding such inferences on his prior experience. Expert 3 praised IoT solutions for the amount and heterogeneity of data gathered with IoT enabled-devices on events, but argued that such applications are still too specific to be cost efficient and to create a successful business model. At the same time, expert mentioned that out-of-event data generation is probably the future of event marketing but is hard to achieve now, even by market leaders such as Google.

The expert was interested in evaluating IoT potential for HR management, saying that this is a very promising idea to augment this service. He mentioned, however, that such applications would be worthwhile on complex or very large events where the personnel is very qualified to benefit from the technology or it is required to manage a lot of personnel which might be very complicated. He supposed that the industry would actually welcome such solutions but this would require developing new business models and increasing practicality and reliability.

Expert 4 valued both operations and marketing potential of IoT as very high. He considers the technology as quite mature already to be implemented at world's top mega events;

however, to his opinion, each specific application must be tailored to the specific event it will be used on, so the cost efficiency is questionable. Expert supposed that this problem could be solved by simplification and standardization of IoT solutions so that they could be easily implemented anywhere.

The expert believed that the best providers for such technologies would be small or medium technology companies or event startups, explaining that, to his opinion, IoT solutions for event management would require not the top technology but successful, efficient business models which are harder to achieve in large, established companies, and suggested that this is what event providers and venture funds should start looking for.

Like Expert 3, he agreed that human resources can be optimized with use of IoT but this would require better, more mature and more cheap technological solutions.

Expert 5 expressed skepticism regarding IoT application but agreed that the potential is quite high. He considers the market demands for the technology as quite low but is positive about the level of user acceptance if the solutions would truly bring something new to the employees and event attendees.

His opinion about operations and marketing was in concordance with opinions of previous experts: he expressed a lot of optimism about IoT adoption in this domain and said that lack of industrial standards is slowing down the adoption process. The expert proposed that this problem could be overcome if technology vendors would put more emphasis on ecosystem building. This process could be started by large vendors or vendor alliances and ultimately benefit the whole industry.

The expert generally rejected the idea of IoT application for HR purposes, assuming that it is feasible only in some special cases but is hardly to benefit most companies in the event industry so the adoption prospects are really low.

Experts 1, 2 and 3 valued potential of IoT application for event human resources management as extremely low, not believing in the possibility of success in the nearest future and arguing that HR processes in event management companies are established and do not require augmentation with such novel technology.

Expert 5, surprisingly, was more optimistic about this, pointing out that event personnel could actually include the performers, whose data is often extremely valuable, e.g. in case of football match. On the other hand, he said, other event personnel and volunteers could also benefit from IoT implementation through enhanced communication and control. Still, Expert 5 believes that IoT implementation here will not happen early in the future.

3.2. Data Analysis

Table 15 displays the resulting scores for each alternative and their sum. The scores generated by the experts for each alternative are given in the Appendix B of the thesis.

Table 15 – Resulting median opinion matrix

Criterion	Event Operations	Event Marketing	Event Human Resources Management
Practicality	0,44	0,44	0,11
Reliability	0,38	0,38	0,25
Cost Efficiency	0,33	0,50	0,17
Standardization	0,40	0,40	0,20
Market Demands	0,44	0,44	0,11
User Acceptance	0,38	0,50	0,13
Business Model	0,50	0,33	0,17
Ecosystem Building	0,33	0,50	0,17
Industry Regulation	0,33	0,44	0,22
Consumer Protection Regulation	0,29	0,57	0,14
Governmental Support	0,25	0,50	0,25
Total Alternative Score	4,07	5,01	1,91

According to our analysis using weighted expert opinions, event marketing reaches the top position regarding the adoption potential for Internet of Things solutions. Event operations field is also ranked highly, while event human resources management potential is estimated as poor ground for IoT integration by all of the experts.

Using the same weighted sum model, we can find the priority factors for each alternative (Table 16); see the Appendix C for weighted sum tables for each alternative.

Table 16 – Criteria ranking for each alternative

Event Operations Criteria	Rank	Event Marketing Criteria	Rank	Event HR Criteria	Rank
User Acceptance	1	Market Demands	1	Industry Regulation	1
Practicality	1	Practicality	1	Reliability	2
Industry Regulation	2	Reliability	2	Consumer Protection Regulation	2
Market Demands	2	User Acceptance	2	Market Demands	3

Consumer Protection Regulation	3	Industry Regulation	2	Practicality	4
Cost Efficiency	3	Business Model	3	Standardizatio n	4
Ecosystem Building	4	Consumer Protection Regulation	4	Business Model	4
Reliability	5	Cost Efficiency	5	Cost Efficiency	5
Business Model	6	Standardizatio n	5	User Acceptance	5
Standardizatio n	6	Ecosystem Building	5	Ecosystem Building	5
Governmental Support	7	Governmental Support	6	Governmental Support	5

Top ranked factors of IoT adoption for event operations are user acceptance, practicality, industry regulation and market demands. This is consistent with expert opinions: most experts named technical practicality, industry regulation and market demands as drivers of adoption. On the opposite side, most said that lack of standardization and proper, reliable business models are currently reducing adoption rates in the field.

In case of event marketing, most experts identify high market demands for IoT solutions there; for example, Expert 1 mentioned that marketing is developing rapidly compared to other business fields, and that all innovative solutions are adopted fast if they show value for the business. This view is supported by other experts and they also mention practicality of IoT for marketing as a key adoption driver. On the other hand, interviewees were concerned with cost efficiency and standardization of solutions, suggesting that these parameters are preventing IoT solutions from entering the market.

Finally, experts generally refused the idea that IoT technologies can be applied to the event human resources management field, and named lack of technical practicality, user acceptance and proper business model knowledge as significant barriers preventing the adoption.

The combined results of the analysis are displayed on the Figure 13 below.

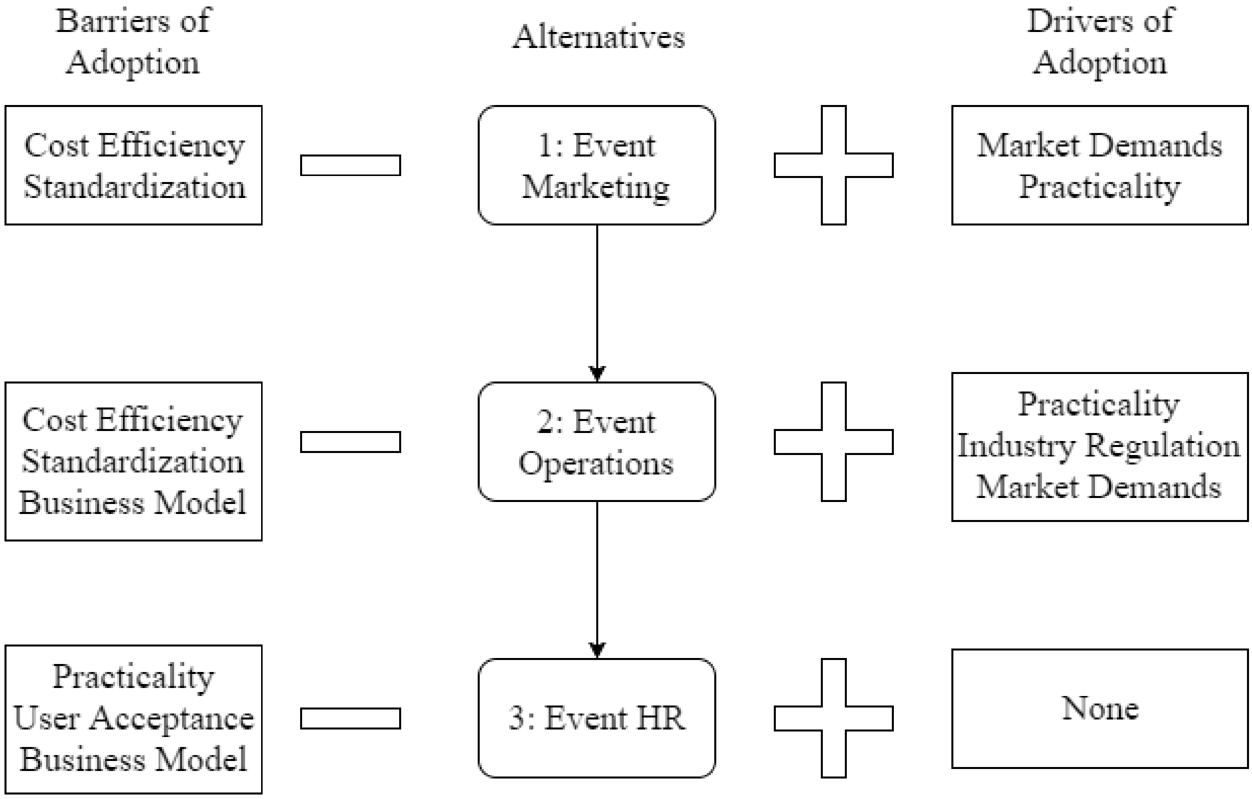

Figure 13 – Alternatives ranking, adoption drivers and barriers

4 out of 5 experts said that they are looking forward to adoption of Internet of Things in the industry, thus claiming that the adoption potential is high. This idea was rejected only by Expert 3, who argued that the solutions are still immature and they will require more development in those spheres that are currently more prone for IoT use (e.g. smart grids) to be introduced to other markets, including event industry.

4. CONCLUSIONS

Internet of Things is not only entering our private lives at increasing speeds, but is also being evaluated and adopted by enterprises from different industries to optimize their various business and technological processes and open new ways for increasing efficiency of their activities. This brings to light the question whether IoT technologies should be adopted at their current level of development, and in what industries and departments such adoption would take place and what benefits would it bring.

IoT solutions for enterprises are very flexible, yet complex and uncertain regarding to what benefits they might bring. The literature suggests that in each particular case the adoption potential should be evaluated independently for a particular industry or a company to ensure smooth and efficient technology transfer in the future, thus essentially transforming the problem into a decision-making task.

Due to high diversity of such solutions it is complicated to construct an appropriate adoption framework, as is the search for experts who are required to have expertise in both Internet of Things technologies and the industry in question. We have overcome this problem by using the technology adoption criteria suggested by Bourgeois (1980) and refined by Kim & Kim (2016), and referring to multi-criteria decision making methods. Using expert interviews as a tool for gathering information, we have aggregated their opinions and identified the best opportunity for IoT integration in event management industry, as well as the barriers and drivers affecting prospective adoption in each case.

In the first chapter we have reviewed current literature about the Internet of Things applications, gathering and combining different definitions of the term to develop a general, single understanding for facilitating further research. Additionally, key adoption criteria were identified to be used in the later analysis. The event industry was also analyzed there to understand how events are classified and how the event industry is organized to see what services and processes can be improved there.

In the second chapter of the research the research methodology was described. Using the consensus decision-making approach, we have evaluated different multi-criteria decision making techniques and chose the weighted sum model as the most appropriate method for our research. We have also described the expert judgment approach that we used to find, sample, interview and elicit knowledge from experts in this domain.

The third chapter of the research is explaining the empirical results of our study.

First, we have described briefly each interview proceeding and the analysis procedure.

First, the three key event services (event operations, marketing and human resources) were evaluated for the IoT adoption potential considering the median opinion of all experts about 11 adoption criteria divided into three major groups: technological prospect, market potential and regulatory environment. Then, we have ranked three alternatives and found that event marketing and event operations are dominating, according to the expert opinions, with the former scoring slightly higher than the latter. Event human resources management, however, was evaluated poorly, mirroring the experts' opinion that this service is unlikely to be successfully augmented with IoT at the current level of development.

Second, for each service we have identified scores for IoT adoption criteria using the weighted sum model approach. The resulting data was compared to the experts' explicit identification of existing barriers and drivers of adoption. For event marketing, the drivers defined by the experts were technical practicality of and market demands for IoT solutions, and the barriers were lack of standardization and questionable cost efficiency of such solutions. For event operations, the experts have named the same drivers as for marketing with addition of industrial regulation factor, and the barriers chosen were cost efficiency, standardization and lack of proper business models. Finally, no drivers of adoption were identified for event human resources management, and practicality, user acceptance and absence of applicable business models have been named as barriers preventing potential adoption.

Finally, the findings of the research were combined to make a clear picture of the adoption potential of Internet of Things for each of the three event services identified and the experts' general estimation of the adoption potential in the industry was described.

4.1. Theoretical Implications

Our research explores the potential of Internet of Things integration in companies operating in event industry. It contains a framework construct that could be used in further studies on the subject that could involve other samples of respondents or other elicitation techniques.

The study results allow researchers to estimate the quality of the methodology and results generated and use the knowledge gained as a basis for developing new, more optimized and efficient research frameworks.

4.2. Managerial Implications

The results of this study are supposed to benefit two groups of users.

First, event industry decision makers can use them as a general view on the adoption potential and make their own decisions regarding the nature and scale of the potential technology transfer, or use it as a starting point for further investigations on their own. The research's empirical results can also be interpreted as a plan for action which depicts the order of adoption and the barriers that must be overcome to ensure success.

Second, the investigation results can be assessed and used by technology companies that develop technology solutions for event industry, or by those that investigate the opportunity to do so. Using the insights gained, decision makers in these companies could assess the overall potential of entering this market. Another use that we suppose is using the results to assess products or solutions of such firms in order to understand whether the key drivers are emphasized or whether there are barriers in such solutions that must be overcome in order to gain competitive advantage.

REFERENCES

1. Ahn, J. Y., Song, J., Hwang, D., & Kim, S. (2010). Trends in M2M Application Services Based on a Smart Phone. *Advances in Software Engineering Communications in Computer and Information Science,* 50-56.

2. Ascher, W. (1978). *Forecasting: An appraisal for policy-makers and planners*. Baltimore: Johns Hopkins University Press.

3. Atzori, L., Iera, A., & Morabito, G. (2010). The internet of things: A survey. *Computer networks*, *54*(15), 2787-2805.

4. Bandyopadhyay, D., & Sen, J. (2011). Internet of things: Applications and challenges in technology and standardization. *Wireless Personal Communications*, *58*(1), 49-69.

5. Barkhuus, L., Engström, A., & Zoric, G. (2014, April). Watching the footwork: Second screen interaction at a dance and music performance. In *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems* (pp. 1305-1314). ACM.

6. Baumgärtner, S., & Winkler, R. (2003). Markets, technology and environmental regulation: Price ambivalence of waste paper in Germany. *Ecological Economics, 47*(2-3), 183-195.

7. Bourgeois, L. J. (1980). Strategy and environment: A conceptual integration.*Academy of management Review*, *5*(1), 25-39.

8. Bowdin, G., O'Toole, W., Allen, J., Harris, R., & McDonnell, I. (2006). *Events management*. Routledge.

9. Bradley, J., Barbier, J., Handler, D., 2013. Embracing the Internet of everything to capture your share of 14.4 trillion. CISCO White Pap. Available at: http://www.cisco.com/web/about/ac79/docs/innov/IoE_Economy.pdf.

10. Braun, E., & Wield, D. (1994). Regulation as a means for the social control of technology. *Technology Analysis & Strategic Management, 6*(3), 259-272.

11. Buhalis, D. (2000). Marketing the competitive destination of the future. *Tourism management*, *21*(1), 97-116.

12. Burrell, G., & Morgan, G. (1979). *Sociological paradigms and organisational analysis* (Vol. 248). London: Heinemann.

13. Chen, S. J., Hwang, C. L., & Hwang, F. P. (1992). Fuzzy multiple attribute decision making(methods and applications). *Lecture Notes in Economics and Mathematical Systems*.

14. Chesbrough, H., & Rosenbloom, R. S. (2002). The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin‐off companies. *Industrial and corporate change*, *11*(3), 529-555.

15. Chui, M., Löffler, M., & Roberts, R. (2010). The internet of things. *McKinsey Quarterly*, 2(2010), 1-9.

16. Crotty, M. (1998). *The foundations of social research: Meaning and perspective in the research process*. Sage.

17. Davis, F. D. (1993). User acceptance of information technology: system characteristics, user perceptions and behavioral impacts. *International journal of man-machine studies*, *38*(3), 475-487.

18. Dodgson, M., Gann, D. M., & Salter, A. (2008). *The management of technological innovation: strategy and practice*. OUP Oxford.

19. e Costa, C. A. B., & Oliveira, M. D. (2012). A multicriteria decision analysis model for faculty evaluation. *Omega*, *40*(4), 424-436.

20. Emery, P. (2010). Past, present, future major sport event management practice: The practitioner perspective. *Sport management review*, *13*(2), 158-170.

21. Ereev, S. Y., & Patel, M. K. (2012). Standardized cost estimation for new technology (SCENT)-methodology and tool. *Journal of Business Chemistry*, 31-48.

22. Gartner. (2012). The internet of things. Retrieved March 31, 2016, from http://blogs.gartner.com/it-glossary/internet-of-things/

23. Getz, D. (2007). Event studies: Theory, research and policy for planned events. Oxford, UK: Butterworth-Heinemann.

24. GEVME. The Internet of Things (IoT) in Events. (n.d.). Retrieved May 24, 2016, from https://www.gevme.com/blog/the-internet-of-things-iot-in-events

25. Global GDP 2010-2020 | Statistic. (n.d.). Retrieved April 04, 2016, from http://www.statista.com/statistics/268750/global-gross-domestic-product-gdp/

26. Goldblatt, J. J. (2002). *Special events: Twenty-first century global event management*. New York: Wiley.

27. Gorden, R. L. (1980). *Interviewing: Strategy, techniques, and tactics*. Homewood, IL: Dorsey Press.

28. Green, K. C., Armstrong, J. S., & Graefe, A. (2007). Methods to elicit forecasts from groups: Delphi and prediction markets compared.

29. Gubbi, J., Buyya, R., Marusic, S., & Palaniswami, M. (2013). Internet of Things (IoT): A vision, architectural elements, and future directions. *Future Generation Computer Systems*, *29*(7), 1645-1660.

30. Gueguen, G., & Pellegtin-Boucher, E. (2004). Coopetition and IT business ecosystems: the success of SAP. *The European Institute for Advanced Studies in Management, September*, 16-17.

31. H. Dutton, W. (2014). Putting things to work: social and policy challenges for the Internet of things. *info*, *16*(3), 1-21.

32. Handfield, R., Walton, S. V., Sroufe, R., & Melnyk, S. A. (2002). Applying environmental criteria to supplier assessment: A study in the application of the Analytical Hierarchy Process. *European Journal of Operational Research*, *141*(1), 70-87.

33. Hernandez-Mogollon, J. M., Folgado Fernandez, J. A., & Duarte, P.A.O. (2014) Event Tourism Analysis and State of the Art. *European Journal of Tourism, Hospitality and Recreation, 5(2), 83-102.*

34. International Design Foundation. (n.d.). Wearable Computing. Retrieved March 31, 2016, from https://www.interaction-design.org/literature/book/the-encyclopedia-of-humancomputer-interaction-2nd-ed/wearable-computing

35. International Telecommunication Union. (2012). Overview of the Internet of things. *Series Y: Global Information Infrastructure, Internet Protocol Aspects and next-Generation Networks - Frameworks and Functional Architecture Models*, 22.

36. Ishizaka, A., & Labib, A. (2009). Analytic hierarchy process and expert choice: Benefits and limitations. *OR Insight*, *22*(4), 201-220.

37. Jaffe, A. B., Newell, R. G., & Stavins, R. N. (2005). A tale of two market failures: Technology and environmental policy. *Ecological Economics, 54*(2-3), 164-174. doi:10.1016/j.ecolecon.2004.12.027

38. Jago, L.K. (1997). *Special events and Tourism Behaviour: A Conceptualisation and an Empirical Analysis from a Values Perspective* (Doctoral thesis, Victoria University, Melbourne, Australia)

39. Johnson, P., & Clark, M. (2006). *Business and management research methodologies: Evaluating research and the question of criteriology*. London: SAGE.

40. Kim, S., & Kim, S. (2016). A multi-criteria approach toward discovering killer IoT application in Korea. *Technological Forecasting and Social Change*, *102*, 143-155.

41. Krupka, M. C., Peaslee, A. T., & Laquer, H. L. (1983). *Gaseous fuel safety assessment for light-duty automotive vehicles* (No. LA-9829-MS). Los Alamos National Lab., NM (USA).

42. Lee, I., & Lee, K. (2015). The Internet of Things (IoT): Applications, investments, and challenges for enterprises. *Business Horizons*, *58*(4), 431-440.

43. Lloyd, R., & Clark, T. N. (2001). The city as an entertainment machine. *Critical perspectives on urban redevelopment*, *6*(3), 357-78.

44. Mattern, F., & Floerkemeier, C. (2010). From the Internet of Computers to the Internet of Things. *Lecture Notes in Computer Science From Active Data Management to Event-Based Systems and More,* 242-259.

45. Matthews, D. (2008). Special event production: The process. Amsterdam: *Butterworth-Heinemann.*

46. Mazhelis, O., Luoma, E., & Warma, H. (2012). Defining an internet-of-things ecosystem. In *Internet of Things, Smart Spaces, and Next Generation Networking*(pp. 1-14). Springer Berlin Heidelberg.

47. Meyer, M. A., & Booker, J. M. (1991). *Eliciting and analyzing expert judgement: A practical guide*. London: Academic.

48. Minerva, R., Biru, A., & Rotondi, D. (2015). Towards a definition of the Internet of Things (IoT). *IEEE Internet Things*, 1–86. Retrieved from http://iot.ieee.org/images/files/pdf/IEEE_IoT_Towards_Definition_Internet_of_Things_Revision1_27MAY15.pdf

49. Moscovici, S., & Doise, W. (1994). *Conflict and consensus: A general theory of collective decisions*. Sage.

50. Myers, S., & Marquis, D. G. (1969). *Successful industrial innovations: A study of factors underlying innovation in selected firms* (pp. 69-17). Washington, DC: National Science Foundation.

51. National Task force on Tourism Data (Canada). Project Team on Festivals and Special Events. Unpublished, 1986.

52. Ortiz, N. R., Wheeler, T. A., Breeding, R. J., Hora, S., Meyer, M. A., & Keeney, R. L. (1991). *Use of expert judgment in NUREG-1150.* Nuclear Engineering and Design, 126(3), 313-331.

53. Phuong Ta, H., & Yin Har, K. (2000). A study of bank selection decisions in Singapore using the analytical hierarchy process. *International Journal of Bank Marketing*, *18*(4), 170-180.

54. Pike, S. (2012). *Destination marketing*. Routledge.

55. Ramanathan, R., & Ganesh, L. S. (1994). Group preference aggregation methods employed in AHP: An evaluation and an intrinsic process for deriving members' weightages. *European Journal of Operational Research*, *79*(2), 249-265.

56. Rangone, A. (1996). An analytical hierarchy process framework for comparing the overall performance of manufacturing departments. *International Journal of Operations & Production Management*, *16*(8), 104-119.

57. Ritchie, J. R., & Crouch, G. I. (2010). A model of destination competitiveness/sustainability: Brazilian perspectives. *Revista de Administracao Publica*, 44(5), 1049-1066.

58. Rogers, E. (2003). The Diffusion of Innovations. Fifth Edition. New York: Free Press.

59. Saaty, T. L. (2004). Decision making: the analytic hierarchy and network processes (AHP/ANP). *Journal of systems science and systems engineering*, *13*(1), 1-35.

60. Saunders, M., Lewis, P., & Thornhill, A. (2015). Research methods for business students. Harlow, England: Pearson Education Limited.

61. Seaver, D. A. (1976). *Assessment of group preferences and group uncertainty for decision making*. Decisions and Designs Inc.

62. Silvers, J. R., Bowdin, G. A., O'Toole, W. J., & Nelson, K. B. (2005). Towards an international event management body of knowledge (EMBOK). *Event Management*, *9*(4), 185-198.

63. Statista. Concert - Market Statistics & Industry Facts. (n.d.). Retrieved May 24, 2016, from http://www.statista.com/stats/147953/concert

64. Statista. Facts on the global tourism industry. (n.d.). Retrieved April 04, 2016, from http://www.statista.com/topics/962/global-tourism/

65. Stroud, M. (1980). *Professional writing: Strategies to improve the transfer of knowledge.* Communications Strategies of Advanced Technologies, Albuquerque, New Mexico.

66. Swan, M. (2012). Sensor mania! the internet of things, wearable computing, objective metrics, and the quantified self 2.0. *Journal of Sensor and Actuator Networks*, *1*(3), 217-253.

67. Tara-Lunga, M.O. (2012). Major special events: an interpretative literature review. *Management & Marketing*, 7(4).

68. *Travis, A. & J. Croize (1987).* The Role and Impact of Mega-Events and Attractions on Tourism Development in Europe: A Micro Perspective. *Proceedings of the 37th Congress of AIEST, Calgary, 28, 59-78.*

69. Triantaphyllou, E. (2013). *Multi-criteria decision making methods: a comparative study* (Vol. 44). Springer Science and Business Media.

70. Tversky, A., & Kahneman, D. (1974*). Judgment under uncertainty: Heuristics and biases. Science*, *185*(4157), 1124-1131.

71. Vedder, R. G., & Mason, R. O. (1987*). An expert system application for decision support in law enforcement. Decision Sciences*, *18*(3), 400-414.

72. Veerasawmy, R., & McCarthy, J. (2014). When noise becomes voice: designing interactive technology for crowd experiences through imitation and invention. *Personal and Ubiquitous Computing*, *18*(7), 1601-1615.

73. Weber, R. H. (2011). Accountability in the Internet of Things. *Computer Law & Security Review*, *27*(2), 133-138.

74. Wei, J. (2014). How Wearables Intersect with the Cloud and the Internet of Things: Considerations for the developers of wearables. *Consumer Electronics Magazine, IEEE, 3(3), 53-56.*

75. Westerlund, M., Leminen, S., & Rajahonka, M. (2014). Designing business models for the internet of things. *Technology Innovation Management Review*,*4*(7), 5.

76. Willey, Z. (1982). Economic Criteria in Environmental Regulation: Prospects for the 1980s. *American Journal of Agricultural Economics, 64*(5), 935.

77. Wisdom, J. P., Chor, K. H. B., Hoagwood, K. E., & Horwitz, S. M. (2014). Innovation adoption: a review of theories and constructs. *Administration and Policy in Mental Health and Mental Health Services Research*, *41*(4), 480-502.

78. Xu, L. D., He, W., & Li, S. (2014). Internet of Things in Industries: A Survey. *IEEE Transactions on Industrial Informatics IEEE Trans. Ind. Inf., 10*(4), 2233-2243.

APPENDIX A – Interview Scenario

1. Please introduce yourself, your company and your title and briefly explain your key responsibilities.
2. How familiar are you with the Internet of Things concept?
(for event/arena managers)
o 3. Are IoT solutions used in event industry? Can you name any examples?
(for technology vendors)
o 3. Do you perceive the interest for IoT from the event industry as of high level?
4. Let us discuss the factors of adoption for each of the three key event activities (see appendix for detailed list)
o Which factors do you consider the most or least important for each activity and why?
o What barriers for adoption do you see today?
5. Can you suggest other factors or barriers for adoption not mentioned before?
o How do you think these factors will affect adoption?
6. Let us sum up the findings.
o Where do you see the highest potential for IoT adoption?
o Which factors will drive adoption, to your opinion?
o Which factors do you perceive as barriers for adoption?
o Which factors are at the highest priority of consideration in your company?
7. How do you perceive the potential of integrating IoT in event industry overall? Will the interest in adoption increase and why?
8. Please feel free to make any comments regarding the interview and the research.
9. Would you mind filling in a short form to help compare your opinion with those of other experts?
10. Would you like your name and your company to be anonymous in all public results of the research?

APPENDIX B – Quantified Expert Opinions

Table 17 - Expert 1 scoring matrix

	Event Operation s	Event Marketin g	Event Human Resources
Practicality	4	3	1
Reliability	3	4	2
Cost Efficiency	3	2	1
Standardization	2	2	1
Market Demands	4	3	1
User Acceptance	4	3	1
Business Model	2	3	1
Ecosystem Building	3	1	1
Industry Regulation	5	3	2
Consumer Protection Regulation	5	2	1
Governmental Support	2	1	1

Table 18 - Expert 2 scoring matrix

	Event Operation s	Event Marketin g	Event Human Resources
Practicality	4	3	1
Reliability	3	4	2
Cost Efficiency	3	2	1
Standardization	2	2	1
Market Demands	4	3	1
User Acceptance	4	3	1
Business Model	2	3	1
Ecosystem Building	3	1	1
Industry Regulation	5	3	2
Consumer Protection Regulation	5	2	1
Governmental Support	2	1	1

Table 19 - Expert 3 scoring matrix

	Event Operation s	Event Marketin g	Event Human Resources
Practicality	4	3	1
Reliability	3	4	2
Cost Efficiency	3	2	1
Standardization	2	2	1
Market Demands	4	3	1
User Acceptance	4	3	1

Business Model	2	3	1
Ecosystem Building	3	1	1
Industry Regulation	5	3	2
Consumer Protection Regulation	5	2	1
Governmental Support	2	1	1

Table 20 - Expert 4 scoring matrix

	Event Operations	Event Marketing	Event Human Resources
Practicality	4	3	1
Reliability	3	4	2
Cost Efficiency	3	2	1
Standardization	2	2	1
Market Demands	4	3	1
User Acceptance	4	3	1
Business Model	2	3	1
Ecosystem Building	3	1	1
Industry Regulation	5	3	2
Consumer Protection Regulation	5	2	1
Governmental Support	2	1	1

Table 21 - Expert 5 scoring matrix

	Event Operations	Event Marketing	Event Human Resources
Practicality	4	3	1
Reliability	3	4	2
Cost Efficiency	3	2	1
Standardization	2	2	1
Market Demands	4	3	1
User Acceptance	4	3	1
Business Model	2	3	1
Ecosystem Building	3	1	1
Industry Regulation	5	3	2
Consumer Protection Regulation	5	2	1
Governmental Support	2	1	1

Table 22 - Median scoring matrix

	Event Operations	Event Marketing	Event Human Resources

Practicality	4	4	1
Reliability	3	3	2
Cost Efficiency	2	3	1
Standardization	2	2	1
Market Demands	4	4	1
User Acceptance	3	4	1
Business Model	3	2	1
Ecosystem Building	2	3	1
Industry Regulation	3	4	2
Consumer Protection Regulation	2	4	1
Governmental Support	1	2	1

APPENDIX C – Weighted Expert Scores

Table 23 - Weighted ranked sum matrix for event operations

	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Weighted Avg	Rank
User Acceptance	0,11	0,13	0,13	0,13	0,12	0,12	1
Practicality	0,11	0,13	0,11	0,13	0,12	0,12	1
Industry Regulation	0,14	0,11	0,11	0,10	0,12	0,11	2
Market Demands	0,11	0,13	0,13	0,10	0,09	0,11	2
Consumer Protection Regulation	0,14	0,11	0,11	0,10	0,06	0,10	3
Cost Efficiency	0,08	0,11	0,08	0,10	0,12	0,10	3
Ecosystem Building	0,08	0,08	0,08	0,13	0,09	0,09	4
Reliability	0,08	0,08	0,08	0,06	0,12	0,08	5
Business Model	0,05	0,03	0,08	0,06	0,06	0,06	6
Standardization	0,05	0,05	0,08	0,03	0,06	0,06	6
Governmental Support	0,05	0,05	0,03	0,06	0,03	0,05	7

Table 24 - Weighted ranked sum matrix for event marketing

	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Weighted Avg	Rank
Market Demands	0,11	0,12	0,11	0,13	0,17	0,13	1
Practicality	0,11	0,16	0,14	0,13	0,09	0,13	1
Reliability	0,15	0,08	0,11	0,06	0,13	0,11	2
User Acceptance	0,11	0,08	0,09	0,13	0,13	0,11	2
Industry Regulation	0,11	0,12	0,11	0,09	0,09	0,11	2
Business Model	0,11	0,08	0,09	0,09	0,13	0,10	3
Consumer Protection Regulation	0,07	0,12	0,09	0,06	0,04	0,08	4
Cost Efficiency	0,07	0,04	0,06	0,09	0,09	0,07	5
Standardization	0,07	0,08	0,09	0,06	0,04	0,07	5
Ecosystem Building	0,04	0,08	0,09	0,09	0,04	0,07	5

Governmental Support	0,04	0,04	0,03	0,06	0,04	0,04	6

Table 25 - Weighted ranked sum matrix for event human resources

	Expert 1	Expert 2	Expert 3	Expert 4	Expert 5	Weighted Avg	Rank
Industry Regulation	0,15	0,09	0,14	0,12	0,13	0,13	1
Reliability	0,15	0,09	0,14	0,12	0,07	0,11	2
Consumer Protection Regulation	0,08	0,09	0,07	0,06	0,27	0,11	2
Market Demands	0,08	0,09	0,14	0,06	0,13	0,10	3
Practicality	0,08	0,09	0,07	0,12	0,07	0,08	4
Standardization	0,08	0,09	0,07	0,12	0,07	0,08	4
Business Model	0,08	0,09	0,07	0,12	0,07	0,08	4
Cost Efficiency	0,08	0,09	0,07	0,06	0,07	0,07	5
User Acceptance	0,08	0,09	0,07	0,06	0,07	0,07	5
Ecosystem Building	0,08	0,09	0,07	0,06	0,07	0,07	5
Governmental Support	0,08	0,09	0,07	0,12	0,00	0,07	5