1 Exposition

Events have been an important part of society ever since. In the last century, the magnitude and range of events has multiplied (Page and Connell, 2011) and, driven by globalization, a vast offering of business, leisure, or scientific events emerged. In recent years, the proliferation of Information and Communication Technology (ICT) enabled the digitalization of events and continues to transform a wide range of organizational activities, which are subsumed under the label of event management (Getz and Page, 2016).

The year 2020 has had a monumental impact on the worldwide economy. In the course of the coronavirus outbreak, the event industry has been been shut down immediately and is likely one of the last to resume normal activities. This *first in, last out* stigma has fueled a political discussion on the industry's future and additionally calls for a rapid response to relocate events into the virtual realm (cf. Westmattelmann et al., 2020; Hacker et al., 2020).

The German market, leading in hosting exhibitions worldwide (RIFEL, 2020, p. 7), is of particular importance in this context: The event industry is the sixth largest branch of industry with around 130 bil. € in revenue and is ranked second in employment statistics (RIFEL, 2020, p. 3–4). As many businesses are tied to the event industry directly (e.g., event agencies or exhibition stand construction firms) or indirectly (e.g., hotels or venue owners), in total around 1.9 million jobs are at stake (RIFEL, 2020, p. 9).

Apart from repercussions of the COVID-19 pandemic, the climate movement poses an additional challenge to the event industry. The rising awareness of environmental responsibility is difficult to reconcile with long-distance trips to attend two-day conferences. In fact, *flight shame* has recently become a dictum and is experienced by 29.5% of business travelers as of 2019 (SAP Concur, 2019).

> **Observation 1.** The event industry is challenged by the COVID-19 pandemic and by the climate movement.

The digitalization of events has multiple facets. For example, digital companion apps support the attendee in physical events. With respect to COVID-19, also virtual event formats are on the rise which especially put forward new ways to experience events online.

Beyond the attendance of events, also organizational aspects of event management are becoming more digital. Since events are constrained in terms of budget and have a fixed spatial-temporal position, event management shows similarities to project management (Thomas et al., 2008a; Sakschewski and Paul, 2017; Eisermann et al., 2014). The specificity of projects is mirrored in the ICT-related requirements: Digital services are not only expected, but need to be tailored to the event. This includes e.g., a dedicated event website with custom registration forms or personalized tickets for the attendees. Especially business events are often seen as an instrument of marketing (Nufer, 2002). This requires brand differentiation and event-specific content, which undermines one-size-fits-all solutions. As a result, dedicated Event Management Software (EMS) emerged.

> **Observation 2.** Information and communication technology plays an essential role in organizing events.

The primary driver of using ICT in this domain is not the improvement of attendees' experience, but realizing efficiency gains in event management: Event organizers indicate that the automation of manual processes (29%) and time savings (18%) are the top two reasons for the adoption of event-related ICT (Cvent, 2017, p. 20). This development emphasizes the high relevance of EMS which is also substantiated by an accelerating market growth (6.3% in 2017) (Research and Markets and Business Wire, 2017; MarketsandMarkets, 2019).

Surprisingly, only 47% of event organizers use EMS (Cvent, 2017). More strikingly, only a 1% increase in utilizing EMS is seen when comparing these numbers to the previous study two years earlier (Cvent, 2015).

> **Observation 3.** While the market for event management software grows substantially, its adoption rate remains moderate.

EMS bundle various business processes of event management into a single software and can hence be classified as application systems. Due to this integration, application systems are complex and have to be adapted to fit the requirements of an organization (Davenport, 1998). Likewise, the business side needs to rework their processes accordingly (Law and Ngai, 2007). Facilitating transparency about the existing requirements and technical possibilities thus becomes a key issue.

One pivotal contribution of Information Systems (IS) research in this regard are conceptual models (cf. Wand and Weber, 2002; Wand et al., 1995). These models serve as vehicles to support the communication between business and IT in the organization. Especially in the advent of Enterprise Resource Planning (ERP) software in the 1990s (cf. Keller et al., 1999), a special type of conceptual model – reference models – proved to be a useful way to inform the design of these application systems from a business and technical perspective.

Observation 4. Conceptual models support the design of application systems.

1.1 Research Objective

Against the background of the first three observations, the event industry is in need of a transformation. Novel event formats and the proliferation of ICT forces event organizers to advance their digital capabilities. Since EMS are the foundation of digital event management and also a prerequisite for realizing sophisticated virtual events, the slow adoption poses a problem.

From the event organizers' perspective, two broad explanations can be found. The first explanation assumes that their existing, fragmented solutions are sufficient and thus no need for EMS exists. In light of the fundamental changes impacting the industry (cf. Observation 1), however, it is unlikely that organizers can continue to ignore the appeal of digital event management offered by EMS.

Alternatively, the event organizers demand EMS, but certain obstacles hinder the adoption. There can be many reasons such as an insufficient fit between requirements and offered solutions, uncertainty about the own requirements, or concerns about data security.

From the author's experience in organizing or supporting the realization of 36 mid-sized and large events[1], event organizers in particular voice concerns regarding

[1] cf. Details are presented in Tab. 4.1.

the flexibility of the software to implement special requirements of their event(s). Due to technical inexperience of the organizers and perceived uniqueness of their requirements, a fallback solution is oftentimes seen in spreadsheet software and segregated web forms resulting in manual processes and the absence of integration. Event organizers need guidance to be convinced by the capabilities of EMS.

Conceptual models are a powerful means to address this issue, as they allow a stripped-down view on a certain subject, such as EMS. However, creating these models is a time-consuming task and critics argue that its added value does not pay off with respect to the spent effort. Against this backdrop, the concept of reference models emerged (Schütte, 1998; Vom Brocke, 2003; Fettke and Loos, 2004). A reference model reduces the modeling effort by reusing model components (Becker and Schütte, 2004). The provision of a reference model thus simplifies the use of models in practice and, at the same time, can incorporate best-practices in the domain.

However, IS research has paid little attention to the event management domain so far. While scholars have investigated events from a behavioral scientific point of view and especially under the lenses of tourism (Getz and Page, 2016), research on information systems for event management, or Event Information System (EIS), is almost non-existent. Consequently, conceptual models of EIS are absent. This research gap manifests itself in the lacking mediation between the business and technical side causing a barrier for adoption. Event organizers, as business stakeholders, are not able to express their requirements due to the lack of adequate models. The creation of such models is cumbersome and requires profound methodical and theoretical knowledge.

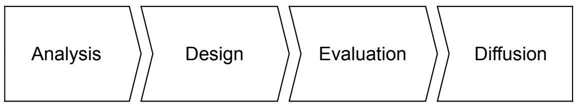
To tackle these problems, this thesis presents a reference model for EIS. It focuses on process and data models as two perspectives proven to be a useful means to support the design of application systems (cf. Becker and Schütte, 2004; Speck and Schnetgöke, 2012). Consequently, the research objective of this thesis is:

> **Research Objective.** The design, instantiation, and evaluation of a data and process reference model for Event Information Systems.

1.2 Research Methodology

This work follows the research paradigm of design science (cf. Peffers et al., 2007; Hevner et al., 2004; Gregor and Hevner, 2013; Österle et al., 2011). Instead of *explaining* phenomena, design science research is concerned with the *design* of artifacts. These artifacts can take many forms, such as models, software systems, or methods (Gregor and Hevner, 2013). Their purpose is to provide *utility*. Given the research goal stated above, the artifact in this design science research project is the Event Information Systems Reference Model (EISRM).

This methodological approach is informed by the work of Österle et al. (2011), which proposes that design-oriented research should be structured into four phases, as shown in Fig. 1.1. Congruent to other seminal works on design science research (cf. Peffers et al., 2007; Hevner et al., 2004), the process is understood as iterative.



SOURCE: (Österle et al., 2011, p. 3)

Figure 1.1: Applied Research Methodology

Analysis

The starting point of the research project is the identification of a relevant problem. In order to assure the novelty of the problem and the absence of a solution, the existent literature has to be analyzed. In addition to the ties to the knowledge base, the contextual environment in which the artifact operates needs to be investigated (Hevner, 2007). These activities result in the definition of solution objectives, i.e., requirements that the artifact ought to fulfill.

Consequently, this work examines the scientific discourse on event management to consider the theoretical foundation of the artifact's domain. Research in the IS discipline and especially in its *Information Modeling* stream is analyzed (i) to assure that relevant design-oriented contributions to this work are identified (such as other reference models), and (ii) to substantiate the theoretical embedding of the utilized methods in the field of modeling.

With regards to the contextual environment, the existing software solutions on the market are analyzed. This is required to assure that the artifact's scope reflects the characteristics of existing EMS especially in terms of covered functionality.

Design

Scientific rigor calls for the use of proven methods in the construction of the artifact. By understanding design as a search process (Hevner et al., 2004), the created design alternatives are compared against the constraints of the problem and solution objectives to improve the utility of the artifact incrementally.

As the design of reference models has a tradition in the IS research community (Becker et al., 2003b), this work can utilize the body of knowledge on reference *modeling* to guide the design process (e.g., Delfmann, 2006; Vom Brocke, 2003; Fettke and Loos, 2004; Becker et al., 2002a; Schlagheck, 2000). In particular, the design of the EISRM is informed by the author's experience in the organization of 36 events. This inductive approach is complemented with the deductive reasoning from the event management literature.

Evaluation

As mentioned above, the utility of the reference model is continuously assessed during the iterative process. A well-executed evaluation method ensures that the artifact lives up to the promises formulated in the solution objectives.

In this work, the *instantiation* of the artifact is chosen as the evaluation method (Österle et al., 2011; Sonnenberg and vom Brocke, 2012). As the artifact's purpose is to support the design of application systems, the instantiation of the EISRM translates to the implementation of an application system. A software prototype is demonstrated that produces evidence of the EISRM's utility in 26 cases (events).

Diffusion

The last phase of the process is concerned with the dissemination of results. The publication of this work contributes to the scientific body of knowledge and might inspire scholars to resolve open matters identified in or as a consequence of this work. The use of the software prototype in a spin-off company, the Event Information Systems GmbH, underlines the practical impact of this research endeavor.

1.3 Structure of the Dissertation

Fig. 1.2 visualizes the structure of this thesis according to the research methodology. The Chapters *Analysis*, *Design*, and *Evaluation* represent the main part.

In Chapter 2, the IS-related research background is presented. Four sections clarify this work's understanding of information modeling (2.1) in general and the data, process, and reference modeling in particular (2.2, 2.3, 2.4). Subsequently, Chapter 3 presents the domain of the proposed reference model, i.e., event management (3.1). Section 3.2 presents two event management frameworks which are also later ingrained in the artifact. Additionally, an overview of IT in the domain is given (3.3). The following Chapter 4 presents the research approach in detail. After clarifying the use of the design science paradigm (4.1), the reader is introduced to the applied research design (4.2).

The analysis is presented in Chapter 5. First, the utilization of reference models in the domain is clarified (5.1). Section 5.2 presents the analysis of existing EMS which is used to specify the scope of the artifact and define the solution objectives (5.3). Chapter 6 delineates the artifact's design. After elaborating on the reference model's framework (6.1), its process components are described (6.2–6.16). Due to this structure, the relevant excerpt of the data reference model is presented within the context of each process. Next, Chapter 7 describes the artifact's evaluation through instantiation. First, the adaptation process of the reference model (7.1) is presented. Next, the reader is introduced to the technical architecture of the software prototype (7.2) and its functionality (7.3). Lastly, the fulfillment of the solution objectives is discussed (7.4), including limitations of this work. Finally, Chapter 8 summarizes the contributions of the thesis (8.1) and concludes with an outlook (8.2).

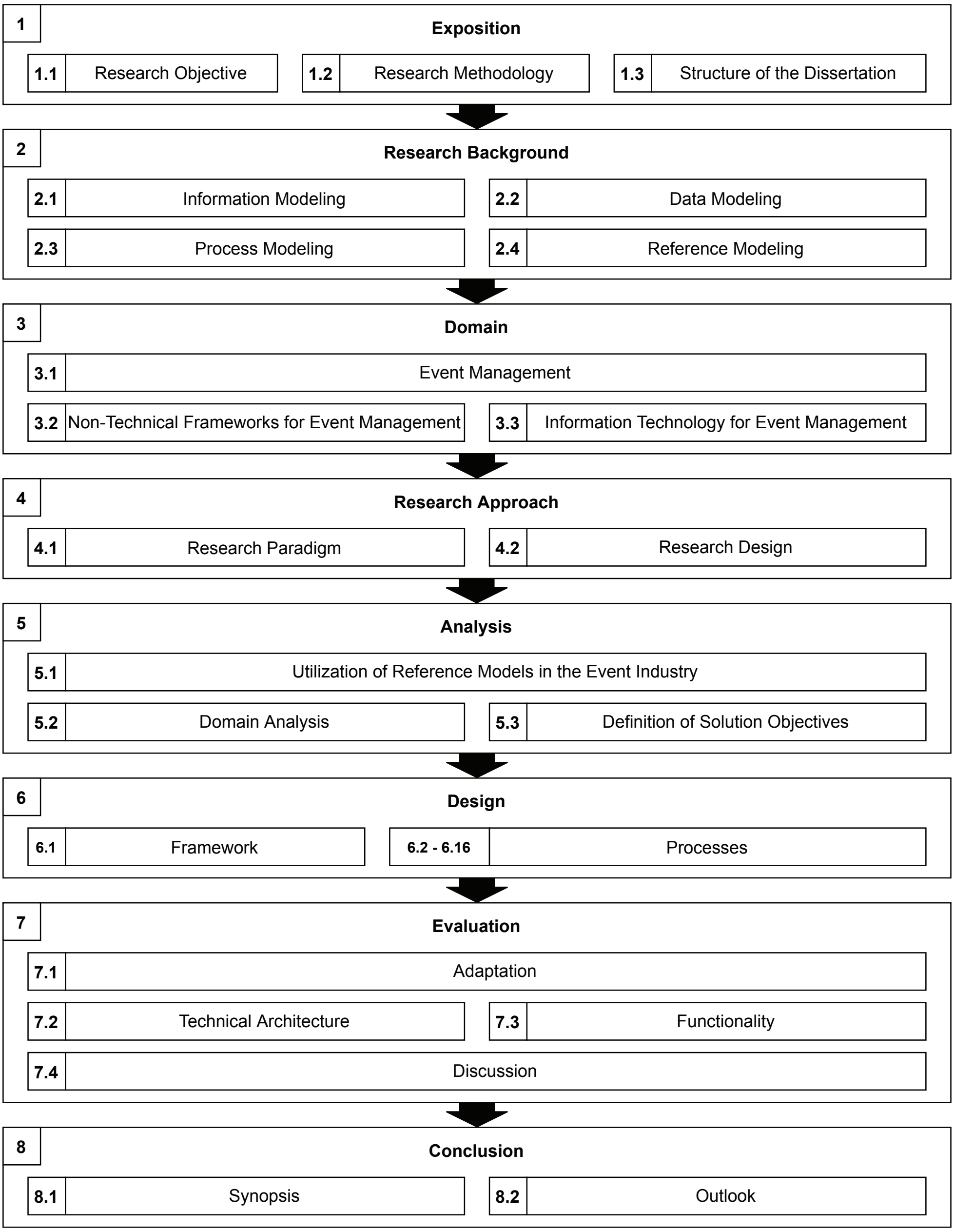


Figure 1.2: Structure of the Dissertation

2 Research Background

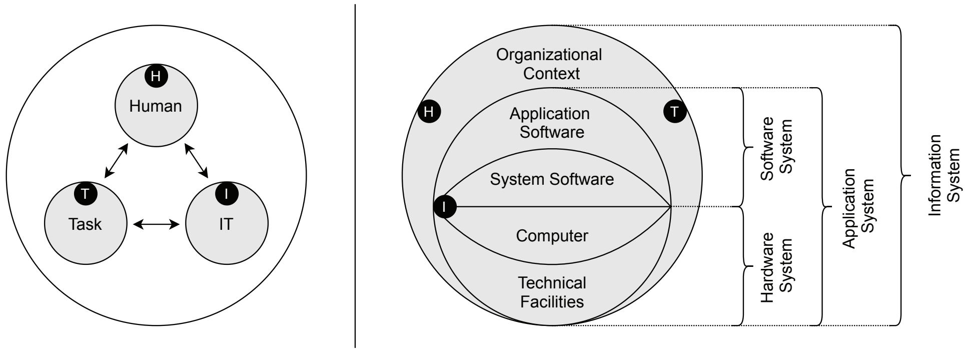
The construction of a reference model depends on two aspects. On the one hand, there is the theoretical foundation about modeling. On the other hand, there is the domain which is described by the model. This chapter covers the first aspect and presents the relevant groundwork in the IS discipline.

2.1 Information Modeling

Information Modeling can be seen as a fundamental component of the IS discipline, as most phenomena under study require models for a discussion among scholars.

2.1.1 Information System

With the proliferation of digital devices and services in the second half of the past century, new challenges in dealing with IT in business environments arose that ultimately formed the field of IS. A commonly accepted definition of IS is absent and different understandings are found in the literature (Hesse et al., 1994; Laudon et al., 2010; Ferstl and Sinz, 2013). In a narrow sense, IS describe the sum of hard- and software systems, which is also called *application system*. With a broader understanding, IS include not only application systems, but also the organizational environment (Teubner, 1999). Following this idea, the IS can be understood as a Socio-Technical System (Emery and Trist, 1960). Based on this, Teubner (1999) presents a hierarchical framework that puts the systems mentioned above into context: Apart from the perspective of system theory (Seiffert, 1992), an IS can also be described as the interplay between the three components *human*, *task*, and *IT* (Teubner, 1999). As shown in Fig. 2.1, the three aspects can be mapped to the system view: Task and Human are



SOURCE: Adapted from (Teubner, 1999, p. 20,26; Hesse et al., 1994, p. 43; Höhenberger, 2019, p. 15)

Figure 2.1: Representations of an Information System

part of the organizational context that surrounds the IT-oriented application system. Together, these constitute an IS, which is defined as follows:

> **Definition 1** (Information System)**.** Information Systems are socio-technical systems comprising human and machine components (subsystems). They support the collection, structuring, processing, provision, communication, and use of data, information, and knowledge as well as their transformation. Information Systems contribute to the decision making, coordination, control, and monitoring of value creation processes as well as their automation, integration, and virtualization under especially economic criteria.
>
> SOURCE: Translated from WKWI & GI FB WI (2011)

2.1.2 Models and Modeling

Theory demands a clear delineation of the objects under study (Gregor, 2006). In the case of IS, representations of the same are required that create this common ground. To this end, information modeling contributes by creating models of IS. A model can be defined as an "immaterial representation of an original for the purposes of a subject" (Becker et al., 2012, p. 1). Based on the work of Stachowiak (1973), three constituting characteristics of models can be observed: mapping (1), reduction