



Lisbon School
of Economics
& Management
Universidade de Lisboa

MASTERS IN MANAGEMENT

MASTERS FINAL WORK

DISSERTATION

LEVERAGING EMERGING DIGITAL TOOLS TO PROMOTE SUSTAINABILITY IN LARGE-SCALE CULTURAL EVENTS: CASE OF BOOM FESTIVAL IN PORTUGAL

ABDUL AZEEZ FAZILUDEEN

SEPTEMBER - 2025



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SEPTEMBER- 2025

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RESUMO

Esta dissertação examina o papel das ferramentas digitais emergentes na promoção da sustentabilidade em eventos culturais de grande escala, com enfoque específico no Boom Festival em Portugal. Embora a sustentabilidade se tenha tornado uma preocupação central no setor da gestão de eventos, tais eventos possuem um potencial significativo para promover práticas ecológicas através da integração de ferramentas digitais. Recorreu-se a uma abordagem mista convergente, na qual foram recolhidos dados quantitativos através de um inquérito online baseado no modelo da Teoria Unificada de Aceitação e Utilização da Tecnologia 2 (UTAUT2), aplicando quatro construtos principais — Expectativa de Desempenho (PE), Expectativa de Esforço (EE), Influência Social (SI) e Condições Facilitadoras (FC) — para identificar preditores que influenciam as Intenções Comportamentais (BI) dos participantes do festival na adoção de ferramentas digitais de sustentabilidade. Os resultados do inquérito foram complementados por informações qualitativas recolhidas através de entrevistas estruturadas com membros da equipa de produção e organização do Boom Festival.

A Modelação de Equações Estruturais por Mínimos Quadrados Parciais (PLS-SEM) indicou que as BI dos participantes relativamente à adoção de ferramentas digitais de sustentabilidade foram fortemente influenciadas por PE e SI. A análise temática das entrevistas identificou quatro temas principais: eficiência operacional através da integração de ferramentas digitais, envolvimento dos participantes via funcionalidades de gamificação, mudanças de hábitos decorrentes da consciencialização ambiental e adoção futura de ferramentas digitais emergentes. Os resultados combinados revelaram a PE como o principal indicador a influenciar as BI, enquanto a SI, embora estatisticamente significativa, não foi diretamente mencionada nas entrevistas. Enquanto isso, tanto a EE e FC foram fracas e estatisticamente não significativas. A matrix de triangulação mostrou uma forte convergência para o PE entre conjuntos de dados.

Este estudo contribui para a literatura da gestão sustentável de eventos ao validar a aplicação do modelo UTAUT2 em contextos não organizacionais e ao oferecer orientações práticas para os organizadores de eventos. Em termos gerais, salienta a relevância das ferramentas digitais emergentes na melhoria do desempenho sustentável e no aumento do envolvimento dos participantes em eventos culturais de grande escala.

Palavras-chave: Sustentabilidade; Ferramentas Digitais; UTAUT2; Intenção Comportamental; Eventos de Grande Dimensão, Envolvimento dos Participantes

Leveraging Emerging Digital Tools to Promote Sustainability in Large-Scale Cultural Events: Case of Boom Festival in Portugal

ABSTRACT

This dissertation examines the role of emerging digital tools in promoting sustainability in large-scale cultural events, with a specific focus on Boom Festival in Portugal. While sustainability has become a paramount concern in the event management sector, such events possess significant potential to promote eco-friendly practices through the integration of digital tools. Using a convergent mixed-methods approach, quantitative data were collected through an online survey based on the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model, applying four key constructs – Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI) and Facilitating Condition (FC) - to identify predictors influencing festival attendees' Behavioral Intentions (BI) to adopt digital sustainability tools. The survey results were complemented by qualitative insights, gathered through structured interviews with stakeholders from Boom Festival's production and organization team.

Partial Least Squares - Structures Equations Modeling (PLS-SEM) indicated that attendees' BI to adopt digital sustainability tools was strongly influenced by PE and SI. Thematic analysis of the interviews identified four major themes: operational efficiency by integrating digital tools, attendee engagement via gamification features, habit shifts following environmental awareness, and future adoption of emerging digital tools. The combined findings revealed PE as the primary indicator influencing attendees' BI, while SI, although statistically significant, was not directly mentioned in the interviews. In contrast, both EE and FC were weak and statistically non-significant across both datasets. Methodological triangulation reflected strong convergence for PE between quantitative and qualitative findings.

This study contributes to the sustainable event management literature by validating the application of UTAUT2 framework in non-organizational settings and by offering practical guidance for event organizers. In general, it highlights the significance of emerging digital tools in enhancing sustainability and improving attendees engagement in large-scale cultural events.

Keywords: Sustainability; Digital Tools; UTAUT2; Behavioral Intention; Large-Scale Events; Attendee Engagement

GLOSSARY

AI – Artificial Intelligence

BI – Behavioral Intention

EE – Effort Expectancy

FC – Facilitating Conditions

IoT – Internet of Things

PE – Performance Expectancy

PLS-SEM – Partial Least Squares Structural Equation Modeling

QR – Quick Response

RFID – Radio Frequency Identification

SI – Social Influence

UTAUT2 – Unified Theory of Acceptance and Use of Technology 2

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1. INTRODUCTION

Sustainability has become a pivotal concern in large-cultural events – which often gather tens of thousands of people – and are linked to poor resource management, including high levels of energy consumption and waste production (Ashwin, 2023, Landrini, 2025). Together, these effects contribute to increasing carbon footprints and challenge long-term sustainability in the event management sector. Despite these limitations, many of these events serve as distinct platforms for promoting sustainability initiatives through the integration of eco-friendly practices in their operational strategies (Landrini, 2025). It is essential to balance the environmental impact associated with these events and preserving the fun and cultural experiences of the audience.

The Organization of Economic Cooperation and Development (OECD), and similar entities have recognized dual strategies like the twin transitions - which refers to the integrated approach that combines technological innovation with green actions to guide sustainability goals - which has favored policy frameworks like the European Green Deal (Nitschke, n.d). These interconnected transitions aim to transform event sustainability by reducing carbon footprints, enhancing resource efficiency and digital sustainability tools.

The drastic levels of resources consumed by these events have reached an unprecedented level. The World Bank reported that global solid waste production has reached an overwhelming 2.24 billion tons in 2020 and is projected to exceed 3.88 billion tons by 2050 (World Bank, 2020). The production and organization of large-scale events, especially music festivals, are among major contributors to these worrying statistics. On average, a music festival can produce about 100 tons of waste within few days, with almost 68% of it ending up in landfills (Gordon, 2024).

The focal context of this research is Boom Festival, the largest psychedelic music and arts cultural festival in the world. Widely renowned for its eco-friendly initiatives and off grid operations, the festival stands out as a pioneer in promoting sustainability within the global events industry (Boom Festival, n.d.). To put into context, each edition of Boom Festival saves approximately 19 million liters of water through its water consumption strategies, embraces solar energy to power lighting, sound, and other operational needs, and implements meticulous waste reduction strategies including categorizing and separating recyclable, compostable, and regular waste (Boom Festival, n.d; Waste &

Compost, 2025). To enhance its economic initiatives, the festival has implemented a range of digital tools that contribute to broader sustainability goals (Uhlhorn, 2021).

While prior studies focused on discrete individual platforms, such as mobile applications or IoT, there remains a gap exploring the combined functionality of these digital tools as an integrated system to enhance ecological performance at large-scale cultural events. Additional research is required to comprehend the relationship between emerging digital tools and their contributions to sustainable event management. This gap highlights the importance of evaluating advantages of integrating digital tools for improving resource efficiency and exploring how such tools influence festival attendees' engagement and sustainability behaviors (Gretzel, Werthner, Koo & Lamsfus, 2015).

The research objectives are triple: (1) to evaluate how digital tools promote eco-friendly initiatives in large scale events, (2) to assess the effectiveness of digital tools in achieving efficient resource management and (3) to examine the impact of digital tools on festival attendees' engagement with sustainability practices. The short-term nature of such music festivals complicates the implementation of long-term sustainability initiatives (Jones, 2017). However, several digital tools offer means to improve this goal. For instance, gamification features such as reward-based systems can motivate long-term behavioral outcomes of participants and encourage them toward sustainability practices in similar contextual settings (Hamari & Koivisto, 2015, Liu, Santhanam & Webster, 2019). This research, centered on Boom Land – the sacred and ecologically rich location where Boom Festival takes place – aims to address three key research questions:

RQ1: How do emerging digital tools enhance sustainability in large-scale cultural events?

RQ2: How do these tools optimize use of resources such as energy, water, and waste?

RQ3: How do these tools influence attendees' engagement with sustainable practices?

This dissertation is structured into five chapters: chapter one introduces the problem, research gaps, and research questions and chapter two delves into an in-depth review of existing literature and presents the conceptual framework. Following, chapter three outlines the methodology, data collection and analysis methods, and chapter four details and discuss the findings. The concluding chapter includes key findings, theoretical & practical contributions, study limitations, and offer recommendations for future research.

2. LITERATURE REVIEW

This chapter reviews previous studies on sustainability in large-scale events and the role of various digital tools in promoting environmental initiatives – emphasizing both currently used solutions and emerging technologies. Additionally, it explores the United Nations Sustainable Development Goals (SDGs) that closely correspond with large-scale events and further introduces the conceptual framework applied. The chapter concludes with a detailed synopsis of Boom Festival, the case study laying the basis of this research.

2.1 Defining Sustainability in Large-Scale Events

Sustainability in large-scale cultural events, especially music festivals, pertains to the organization and management of events aimed at reducing adverse environmental, social, and economic effects (Ashwin, 2023; Jones, 2017). Environmental sustainability in this study focuses on reducing resource consumption, waste production, and carbon emissions (Ashwin, 2023). Many large-scale events, which typically lasts 7 to 10 days and occur once or twice a year consume significant amounts of energy for lighting, sound and other requirements. Boom Festival is one of the largest music and arts festivals in the world and exemplifies sustainability in its core structure. The use of solar power and compost toilets are two of its many effective initiatives to minimize ecological impact and reduce their share of carbon footprint (Boom Eco Paradigm, 2025).

Social sustainability refers to culturally diverse and inclusive environments. For example, Boom Festival welcomes around 40000 people from over 160 countries and adopts unique strategies for social integration, cultural exchange, and community involvement, thereby creating a safe and accessible space for attendees, employees, and performers. (Ashwin, 2023, Boom Festival, n.d).

Economic sustainability refers to the financial viability of these events and the fair distribution of benefits to local communities (Ashwin, 2023). To clarify this, in 2014, the Karuna Project was introduced by Boom, aiming to share part of their revenues with the local Idanha-a-Nova community (Boom Festival, n.d). By 2018, the project had grown rapidly and expanded its influence beyond local communities and donated over €40000 to various projects aimed at providing a better and more sustainable future. Figure 1 displays the twelve domains of sustainability that Boom Festival excels in.

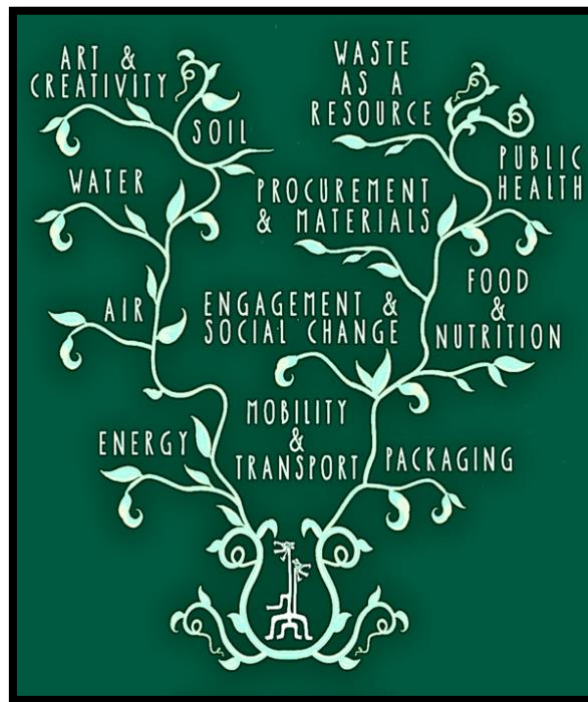


FIGURE 1 – BOOM FESTIVAL SUSTAINABILITY PARADIGM

Source: Boom Festival (n.d)

Evidently, the concept of sustainability in large-scale cultural events is a broad process aimed at reducing ecological impact, improving social inclusion & ensuring long-term financial stability. Event planners and organizers must be mindful about the importance of environmental, social and financial factors throughout all phases of an event - from planning to implementation - to achieve this balanced outcome.

2.2 Key SDGs for Large-Scale Events

The global outreach of large-scale events offers substantial potential to advance key UN SDGs, primarily SDG 13 (Climate Action), SDG 12 (Responsible Consumption & Production), and SDG 11 (Sustainable Cities & Communities) (Bounds, 2024).

SDG 13 (Climate Action) warrants the need for an immediate response to threats posed by rapid climate change. By adopting renewable energy, sustainable transportation, and implementing waste reduction strategies, such events can shape and motivate festival attendees to engage in sustainable practices. For example, the implementation of solar panels and composting strategies adopted by Boom Festival illustrates how large-scale events can lead by example in promoting sustainable performance (Boom Festival, n.d.)

SDG 12 (Responsible Consumption and Production) is directly aligned with large scale events due to their significant demand for products and services. To minimize environmental impact, resource consumption must be cautiously managed. This includes minimizing waste, promoting recycling, and green products. Boom Festival has implemented advanced recycling systems for diverse waste types and has achieved the goal of zero waste to landfill (Jones, 2017; Powerful Thinking, 2021).

SDG 11 (Sustainable Cities and Communities) aims to promote and build sustainable cities and communities. Large-scale events can support surrounding localities by helping build green infrastructure, such as water refill facilities & compost toilets (United Nations, 2015). Boom Festival fosters community engagement through local job opportunities and prioritize national brands and products, preserving local culture, and avoiding dependence on fossil fuel by utilizing solar energy to reduce carbon offset (Trinasolar, n.d).

By striking a balance between commercial viability and environmentally favorable actions, such events can foster sustainability by incorporating ecological initiatives into their operations and promote eco-practices through their extensive audience reach. These SDGs (see Figure 2) serve as a roadmap for large-scale events to address environmental issues, contribute to development of local communities, and advance global sustainability.



FIGURE 2 – SDGs ALIGNED WITH LARGE-SCALE EVENTS

Source: United Nations (n.d)

2.3 Digital Tools for Sustainable Event Management

Digital Engagement Tools

Digital engagement tools enhance festival attendees' interaction with sustainability practices, hence encouraging the adoption of eco-friendly behaviors. According to

Harrington (2025), Beamian promotes the use of digital tools like event mobile applications & QR codes to provide real-time updates, enhance audience interaction, and advance sustainable practices. Mobile applications improve value for participants in sustainable practices by providing features including offline maps, automated push notifications, and paperless transactions. Boom Festival employs an interactive mobile application that educates attendees on waste segregation, provides eco tips, and motivates participation in ecofriendly activities via push notifications (Boom Festival, n.d.).

Additionally, QR codes cuts down paper dependency by distributing and sharing information digitally, simultaneously enhancing engagement and sustainability (Harrington, 2025; Chen & Yu, 2024). These codes are placed across the event horizon, allowing attendees to access various details with a simple tap of their phones. This leads to significant avoidance of printed materials, while boosting audience engagement through swift activities that align with eco-friendly initiatives (Chen & Yu, 2024).

Digital Infrastructure Tools

Beamian (2023) explains the impact of integrating infrastructure tools in large-scale events, benefiting both event planners and attendees. Boom Festival employs the use of Radio Frequency Identification (RFID) enabled wristbands (see Figure 3) to ease entry process, cashless payments, and enable organizers to track purchasing behavior of attendees (Boom Festival, n.d.). This technology is redefining efficiency and engagement standards by integrating RFID chips in wristbands to create seamless attendee experience.



FIGURE 3 – RFID WRISTBAND USED AT BOOM FESTIVAL: 2025 EDITION

RFID technology improves logistics management and helps minimize environmental harm associated with wasteful resource management. For instance, IoT-enabled water refill stations are designed to monitor water levels and ensure efficient distribution across premises, therefore reducing the dependence on single-use plastics (Lopes et al., 2024).

Behaviour-Nudging Tools

Behavior-nudging digital tools have become potent mechanisms fostering sustainable practices in large-scale events. These tools employ eco feedback systems and interactive gamification features to subtly guide attendees toward eco-friendly behavior, without limiting their freedom of action (Suter, 2008). Eco-feedback display provides visual interfaces that offer participants real-time data about their sustainability related activities, thereby encouraging adoption of energy-efficient practices (Beamian, n.d).

Gamification further enhances attendee engagement by incorporating reward systems in form of eco - points and discounts for engaging in ecological practices such as recycling (Venturi et al., 2024). The Boom mobile application includes gamification features that encourage eco-friendly actions among attendees in return for credits added to their wristbands, that are redeemable for food, drink, or any cashless services across the event.

Integrating these digital tools into operational strategies allows the event sector to pro sustainability performance, resulting in seamless operational and long - term engagement behaviors among festival attendees (Harrington, 2025; Venturi et al., 2024).

2.4 State of the Art: Emerging Digital Tools

The incorporation of digital tools in large-scale cultural events has initiated a new phase of sustainability. The following sub-sections describe select emerging digital tools that are poised to enhance sustainability initiatives in the event management industry.

The Internet of Things (IoT)

The Internet of Things (IoT) technology is vital in event operations as it allows event planners to track and manage resource consumption and capacity levels. Real time data gathered from digital solutions such as IoT-enabled sensors enables prompt and informed decisions (Atzori, Iera, & Morabito, 2010). Boom Festival has implemented IoT-enabled sensors to measure and assure optimal resource management, including regulating energy use through solar panels and tracking and monitoring water usage and smart bins.

Artificial Intelligence (AI)

AI is an emerging and promising digital tool for advancing sustainability performance in large-scale events. Recent studies emphasize AI's growing importance in predictive crowd flow analysis and forecasting energy demand. (Abonamah, Hassan & Cale, 2025). According to Sustainstage (2024), AI can evaluate real time festival data to significantly reduce carbon emissions, and by up to 50%. There is extensive agreement on adoption of AI to promote sustainability. It is just a matter of when and who makes the first move.

Blockchain Technology

Blockchain has emerged as a robust digital tool in enhancing environmental sustainability (Bhatt & Emdad, 2025). The technology is currently under testing to confirm its effectiveness in ensuring transparency and accountability in economic initiatives such as waste reduction and carbon offsetting. This transparency would allow attendees, organizers, and stakeholders to understand the actual impact of sustainability initiatives (Saber, Kouhizade, Sarikis & Shen, 2019). Moreover, blockchain can be used to manage transactions involving green credits or rewards for sustainable actions (Atzori et al., 2010). Blockchain technology has enormous potential in fostering a more sustainable future by transforming the way in which events are organized and provides a robust approach to confirm eco-friendly practices by adopting emerging digital tools.

The potential future integration of these digital tools in event planning will enable sustainability through optimized resource consumption, enhanced operational efficiency, and promoting increased levels of engagement behaviors among festival attendees.

2.5 Conceptual Framework and Research Model

The conceptual framework of this research is based on the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2). This model explains and predicts an individual's willingness to use a specific technology (Venkatesh et al., 2003).

While the original UTAUT model explained technology adoption in organizational context, the UTAUT2, developed by Venkatesh, Thong, and Xu (2012), extends the previous model by incorporating consumer behavior elements relevant to technology adoption among individuals and in non-organizational contexts. UTAUT2 has been widely used in studies about digital platforms and emerging technologies due to its robust explanatory power in predicting technology adoption (Venkatesh et al., 2012). The theory

states that acceptance of technology is determined by specific constructs, all of which will be applied in this study as well. Table 1 defines the applied UTAUT2 constructs.

TABLE I – APPLIED UTAUT2 CONSTRUCTS WITH DEFINITIONS

Construct	Definition
Performance Expectancy (PE)	The extent to which users believe digital tools will benefit or enhance their performance to some extent
Effort Expectancy (EE)	The degree of ease associated with using digital tools influencing the likelihood of adopting technology
Social Influence (SI)	The degree to which users perceive that their important peers believe they should adopt the technology
Facilitating Conditions (FC)	The extent to which users believe technical and infrastructural support exists to enable digital tool use
Behavioral Intention (BI)	The willingness and intention of an individual to adopt, and continue using a digital technology

Source: Venkatesh et al. (2012)

The four fundamental constructs applied in this study are: PE, EE, SI, and FC. The four independent variables predict the dependent variable of BI. The variables of Hedonic Motivation (HM), Price Value (PV), & Habit from the UTAUT2 were omitted from this study due to their limited relevance in short-term, non-purchase-based event context, which limit the explanatory effect of these constructs (Dwivedi et al., 2020). This highlights the model's flexible and adaptive design to various technological and theoretical contexts. For instance, the digital tools used at Boom Festival are free of cost, and the temporary short-term nature of the festival minimize the relevance of constructs such as PV & Habit, thus justifying their exclusion from this study.

Similarly, Use Behavior (UB) was not selected as the dependent variable because it applies to long term actual usage of technology. The aim of this study is to predict the willingness of attendees to adopt technology, which makes BI more relevant dependent variable. BI has stronger capacity in identifying factors influencing user willingness, compared to UB, which is more applicable for determining long term and actual use of the technology (Davis, 1989; Venkatesh et al., 2012). BI has been widely validated in digital innovation studies, confirming its reliability as a predictor of technology adoption.

This approach provides a robust framework for understanding the impact of digital tools on both event sustainability and behavioral outcomes of attendees. By analyzing the factors influencing BI, the study reflects attendees readiness to use digital sustainability tools, subsequently bridging the gap between theoretical models of technology adoption and their practical application in enhancing sustainability in large-scale cultural events.

The research model is the foundational representation of the conceptual framework, used to test the hypothesis relationships between the constructs. In this study, the research model (See Figure 4) examines the impact of PE, EE, SI, and FC – all hypothesized – to have a positive influence on attendees' BI to adopt digital sustainability tools in large-scale cultural events (Gretzel et al., 2015; Venkatesh et al., 2012).

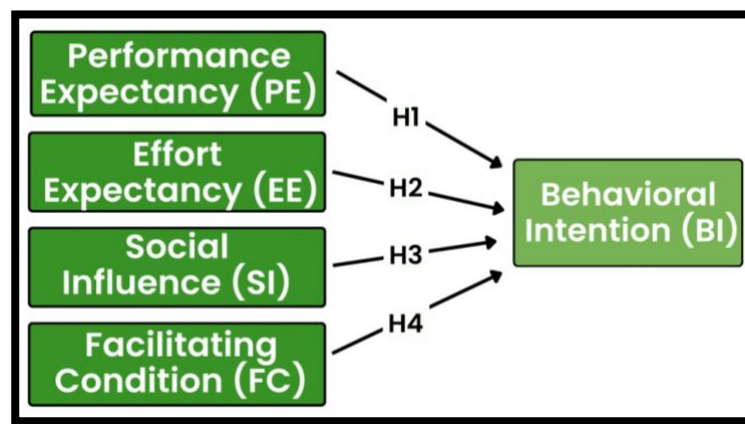


FIGURE 4 – RESEARCH MODEL

Source: Venkatesh et al. (2012)

H1: Performance Expectancy Hypothesis

PE refers to the perception that using technology which benefits or enhances the experience of attendees is an important factor influencing technology adoption. Previous literature highlights PE as one of the strongest predictors influencing BI, showing its significance across contexts (Venkatesh, Thong & Xu., 2012). According to Amini & Bakri (2015), the perceived advantages experienced by users of cloud computing had a significant influence on organizations implementing it, while Lin (2014) stated that perceived benefits expected by users substantially influenced their decision to adopt electronic management systems. In this study, the use of digital tools such as RFID wristbands and Boom mobile application are expected to enhance convenience and improve overall experience of attendees. Therefore, we hypothesize: *H1: PE has a positive influence on BI to adopt digital sustainability tools.*

H2: Effort Expectancy Hypothesis

EE reflects the ease of using technology. When festival attendees perceive that the digital tools are easy to understand and require minimum help, they often develop the intention to use them (Venkatesh et al., 2003). EE has been shown to have direct influence on technology adoption. For example, EE has encouraged students to use ChatGPT in higher education settings because of its user-friendly nature (Duong et al., 2023). In large-scale festivals such as Boom festival, attendees are more likely to adopt digital tools if their interfaces and usability are simple and quick (Venturi et al., 2024). Therefore, we hypothesize: *H2: EE has a positive influence on BI to adopt digital sustainability tools.*

H3: Social Influence Hypothesis

SI refers to the degree to which user's perceive that their peers – friends, family and important others – believe that they should use a technology (Venkatesh et al., 2003). Previous studies have signified the impact of social norms, collective values and peer dynamics in influencing BI (Dwivedi et al., 2020). According to Slade et al. (2015), SI was a key factor motivating users to adopt mobile payment methods and noticed wider adoption as more people within a social circle started using it. In this study, SI is the extent to which festival attendees follow peers engaging in sustainability practices and may feel motivated to engage in similar behaviors by using digital sustainability tools. Therefore, we hypothesize: *H3: SI has a positive influence on BI to adopt digital sustainability tools.*

H4: Facilitating Condition Hypothesis

According to Venkatesh, Thong & Xu (2012), FC denotes to the degree to which an individual's BI is influenced by the perception that sufficient technical and infrastructural support are available to enable the use of technology. Previous studies reflect the importance of FC elements such as reliable network connectivity, technical assistance and device compatibility in influencing user's BI to adopt technology (Baptista & Oliveira, 2015). In the context of this study, attendees' willingness to use digital sustainability tools may increase if they believe that conditions such as volunteer support and reliable internet connection are available. Therefore, we hypothesize: *H4: FC has a positive influence on BI to adopt digital sustainability tools.*

These hypothesized relationships form the foundation of this study's research model, which tests the validity of the constructs within the eco-friendly context of Boom festival.

2.6 Case Context: Boom Festival

Boom Festival, held biannually on the shores of Idanha-a-Nova in Portugal, is one of the largest music and arts events in the world, attracting around 40000 attendees. Recognized as one of the most sustainably oriented festivals, Boom's philosophy prioritizes delivering an environmentally sound experience that minimizes ecological impact while maximizing cultural and artistic engagement (Boom Eco Paradigm, 2024).

Boom Festival is a leader in its successful sustainability agenda and has been awarded with several achievements from national, international and independent organizations across the world – to date achieving around 18 awards for their continuous contributions to the environment (Awards & Nominations, 2025). The festival's composting system diverts organic and human waste into nutrient-dense soil, using zero water or chemical products and remaining clean and virtually odorless (Boom Festival, n.d).

Boom Festival serves as an exemplary case for this study because of its pioneering efforts in enhancing sustainability using digital tools. The following digital tools are used by attendees to promote ecologically responsible behaviors by reducing dependence on physical resources, while advancing overall sustainability performance. RFID enabled wristbands, which enable easy check-ins and cashless payments, while cutting down need for paper receipts (E-tag RFID, 2025). QR codes, placed strategically across festival premises to provide instant digital access to all program related information and replacing traditional solutions such as flyers, hence reducing waste generated (Labellink, 2024; Jones, 2017). The Boom mobile application functions as a key digital tool by offering offline maps, program schedules, live updates, eco-tips and gamified features such as push notifications that improve attendee engagement and participation (Bowkis, 2024). Also, IoT-enabled smart bins and water refill stations that enhance optimized resource management by reducing single-use plastics and promoting categorized recycling.

The integration of these digital tools reduces Boom Festival's carbon footprint and improves sustainability practices, reinforcing its obligation to a greener future. Current literature addresses the environmental challenges of such events and how emerging digital tools are paving ways to contest these problems. This study aims to lay the foundation for future studies by examining the role of emerging digital tools in enhancing sustainability at large-scale events, with the following chapter presenting the methodological approach.

3. METHODOLOGY

3.1 Research Design

This study adopts a convergent mixed-methods approach—combining quantitative and qualitative data—to provide broad understanding on how digital tools enhance sustainability performance at large-scale cultural events. Kalpokas & Hecker (2023) mentions the benefits of this multi-dimensional analysis, emphasizing more actionable and in-depth outcomes that offer a complete perspective on complex research topics.

The quantitative part involved conducting a survey to analyze festival attendees' BIs regarding the use of digital tools for sustainability at Boom festival. The survey was designed following the UTAUT2 model (Venkatesh et al., 2012). The implementation, operational planning, and impact of digital tools on attendees were explored from an organizational perspective through structured interviews with stakeholders from the Boom Festival team, following the qualitative component of this approach.

The justification for this method allows for methodological triangulation, enhancing the reliability and depth of the results (Creswell & Plano Clark, 2017). While the survey collected quantifiable data on attendees' adoption trends, the interviews provided in-depth insights on the design and deployment of digital tools from an organizing standpoint.

This triangulation approach forms a robust link between attendees' behavior trends and actual practices implemented by the festival, providing statistically quantifiable data, backed up by relevant facts that help address the three research questions (DeJonckheere et al., 2024; Venkatesh et al., 2012). The following sub-sections detail the data collection and data analysis methods used to address the research objectives.

3.2 Data Collection Methods

Quantitative Data - Survey

The survey was developed based on constructs from the UTAUT2 framework - PE, EE, SI, and FC – and was published online through Google Forms. The questionnaire included 18 validated Likert-scale items, specifically adapted to the context of Boom festival. These items were associated with their respective constructs as follows: PE: 4 items, EE: 4 items, SI: 3 items, FC: 4 items & BI: 3 items. Each response was rated on a 5-point Likert scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree).

The survey was distributed across social media platforms - Facebook, Instagram, Discord, and Reddit - specifically targeting Boom Festival communities to reach individuals who had previously attended the event. This criterion was essential to ensure that responses were based on actual experiences. Branching logic in Google Forms excluded non-attendees to confirm contextual relevance of responses. The survey questionnaire, including the constructs, items, & rating scale, is provided in Appendix 1.

Qualitative Data – Structured Interviews

To complement the survey data, structured interviews were conducted with purposively selected stakeholders from Boom Festival’s production and organizing team. Responses were collected typographically through Google Forms due to logistical & schedule constraints due to the team’s preparations for the festival’s latest edition in July 2025. The asynchronous structure allowed participants to respond at their convenience, while maintaining consistency among responses (Creswell & Plano Clark, 2017).

TABLE II – STRUCTURED INTERVIEW GUIDE

Q#	Interview Questions	Domains
1	Can you describe your role and how long you have been involved with Boom Festival?	Role / Department
2	How would you describe Boom’s overall sustainability strategy?	Sustainability
3	Which sustainability domains do you feel Boom excels in?	Sustainability Performance
4	From your perspective, how have digital tools contributed to sustainable outcomes at Boom Festival?	Digital Tool(s) Usage
5	What kinds of digital tools have been implemented to support sustainability? Which tool do you think had the biggest influence?	Digital Tool(s) Usage
6	In your experience, how effective have these digital tools been in improving sustainability metrics at Boom over the years?	Decision Making
7	Have you observed changes in attendee behavior toward improved ecofriendly practices that were influenced by these digital tools?	Behavioral Outcomes
8	Looking ahead, how do you see latest emerging digital tools improve sustainability at Boom Festival over the next 5 years?	Future Outcomes

The interview began with informed consent forms (Appendix 2), ensuring the anonymity and confidentiality of participants' responses. The interview guide was developed in alignment with main domains of research questions and conceptual framework. Questions were designed to explore core areas (See Table II) - sustainability performance, digital tool usage, decision-making, behavioral change, and future outlook.

3.3 Data Analysis Methods

Quantitative Data – PLS-SEM Analysis

The survey data were analyzed using Partial Least Squares - Structural Equations Modeling (PLS-SEM) in SmartPLS4. This approach was selected for its suitability in interpreting exploratory research models with small sample sizes (Hair et al., 2019). The analysis followed a three-step evaluation approach: (1) measurement model analysis, (2) structural model analysis and (3) hypotheses testing – using bootstrapping technique.

The measurement model evaluated the validity and reliability of the four constructs. The structural model output ensured collinearity, identified the coefficient of determination, and analyzed the strength of relationships between constructs by assessing path coefficient values, before testing the proposed hypotheses (H1 – H4). The findings revealed key indicators influencing attendees' BIs to adopt digital tools to promote sustainability initiatives in large-scale cultural events such as Boom Festival.

Qualitative Data – Thematic Analysis

The interview responses were thematically analyzed following Braun & Clarke's (2006) six-phase framework. This included data familiarization, formation of initial codes, sub-themes, review of data, identifying final themes, and lastly, drafting a detailed report (Braun & Clarke, 2006). This approach enabled a methodologically systematic analysis, ensuring transparency and rigor while identifying four major themes which are defined in the next chapter, along with quantitative findings and the triangulation matrix

By adopting a convergent mixed methods approach, the study aims to provide depth and breadth in comprehending the role of digital tools in promoting sustainability at Boom Festival. The findings of the mixed methodology are briefly discussed in the next chapter.

4. RESULTS

This chapter outlines the findings from the survey and structured interviews. The results are integrated through methodological triangulation, providing in-depth comprehension of the combined data and strengthening the validity of the analysis.

4.1 Quantitative Results

Data Preparation & Descriptive Statistics

Despite the survey forming 126 respondents in total, six responses were excluded because they answered ‘No’ to the screening question (“Have you previously attended Boom Festival?”). The eligibility criteria for participants were met this way, which required prior attendance at Boom festival. Following, a total of 120 valid responses remained from past festival attendees. Purposive sampling was used to recruit participants through social media and targeted Boom festival related communities, where previous attendees are known to be active and engaged, especially during summer festival season

TABLE III – RESPONDENTS’ AGE GROUP AND FREQUENCY OF VISIT

Category	N	%
Age 18 - 34	103	85.1%
Age 35 - 44	12	9.9%
Age 45+	15	4.9%
Repeat Attendees	74	60.3%
One-time Attendees	47	39.7%

Source: Ringle, Wende & Becker (2024)

Regarding the demographic breakdown of the survey respondents, the age distribution was predominantly younger, with almost 85% aged between 18 and 34 (see Table III). This is consistent with the typical demographic of digital tool adopters at large-scale cultural events such as Boom Festival (Gretzel et al., 2015). Older age groups were also among the respondents, and although they represented a much smaller portion, they still allow for some cross-generational insights on digital sustainability commitments.

Furthermore, around 60% of the 120 respondents had attended Boom Festival more than once, displaying a group that has more than adequate exposure and experience with

the festival's ongoing advancements in sustainability initiatives and use of digital tools. This information is important, since repeat attendees are more likely to notice changes in operational methods across many editions, such as the implementation of RFID wristbands that started in recent years (Marina, 2018).

The descriptive statistics of the constructs measured in the study showed strong agreement among respondents, with most constructs scoring mean values of 4.0 and above (see Table IV). The outcomes affirm substantial user interaction with digital tools at Boom Festival, supporting the dataset for further analysis by applying the PLS-SEM model.

TABLE IV – DESCRIPTIVE STATISTICS OF UTAUT2 CONSTRUCTS

Variable	N	Mean	Median	SD
PE	120	4.20	4.30	0.65
EE	120	3.80	3.90	0.72
SI	120	4.00	4.10	0.68
FC	120	3.50	3.60	0.75
BI	120	4.10	4.20	0.61

Source: Ringle, Wende & Becker (2024)

4.1.1 Measurement Model Assessment

The measurement model was assessed to ensure construct reliability and validity following guidelines of Hair et al. (2019). The evaluation criteria included indicator reliability, internal consistency reliability, convergent validity, and discriminant validity.

Indicator Reliability

The measurement model began by evaluating indicator reliability, which defines the variance explained by each indicator in its relative construct. The recommended threshold for outer loadings is 0.70 (Hair et al., 2019). Most items met or exceeded this range. There were some exceptions including FC3 (0.40), PE2 (0.51) and BI3 (0.54). Regardless, all items were retained to ensure the theoretical scope of the UTAUT2 model in the exploratory nature of this study (Hair et al., 2019).

Internal Consistency Reliability

Internal consistency reliability was measured using Cronbach's alpha and composite reliability (CR). Cronbach's alpha values ranged from 0.45 to 0.75, with SI (0.75) reflecting highest reliability. While some constructs achieved lower Cronbach's alpha values, the CR scores demonstrated adequate internal reliability. SI again exhibited strongest reliability (0.84), followed by EE (0.77), PE (0.70), BI (0.69) and FC (0.65). According to Hair et al. (2019), the benchmark for CR is 0.70, and 0.60 in exploratory studies. Hence, all four constructs confirmed internal consistency reliability.

Convergent Validity

Convergent validity is established when the Average Variance Extracted (AVE) meets or exceeds 0.50. In this model, only SI (0.65) crossed this recommended threshold, while the other constructs ranged between 0.43 and 0.45, nearly missing the criterion. Nevertheless, as Hair et al. (2017, 2019) note, AVE scores slightly below 0.50 may be acceptable, on the condition that CR exceeds 0.60, since this indicate that the construct captures enough variance of its indicators. Since this condition was met across constructs in this study, convergent validity was determined to be satisfactory.

Discriminant Validity

Discriminant validity ensures constructs are empirically different, and was examined applying both Heterotrait-Monotrait (HTMT) ratios and Fornell-Larcker criterion (Rasoolimanesh, 2022). HTMT ratios showed concerns with three construct pairs above 0.90, however, the Fornell-Larcker criterion supported discriminant validity, as each construct's AVE square root exceeded its correlations with other constructs.

Although the Fornell-Larcker criterion confirm validity, the HTMT results require careful consideration. Values crossing 0.90 may suggest potential construct overlap, but this is not uncommon in exploratory studies, especially in event-based contexts where behavioral patterns are examined. Such values can also be tolerated in early stages of exploratory studies, given the constructs remain theoretically distinct (Hair et al., 2019).

Overall, the measurement model analysis indicated moderate but acceptable reliability and validity of constructs. Despite some criteria falling below thresholds, items were retained for theoretical relevance and to preserve the UTAUT2 model's comprehensiveness, deeming the model fit for structural assessment (Hair et al., 2019).

4.1.2 Structural Model Assessment

The next step involved examining the structural model to test the proposed hypotheses between constructs (H1 – H4). The structural model measures the relationships between constructs. The following criterion were analyzed, including inner model VIF, path coefficients, significance levels, and coefficient of determination (R^2).

Collinearity

To ensure that no two constructs were correlated, the structural model began by deriving the inner Variance Inflation Factor (VIF) values. The inner VIF was calculated, and all four constructs displayed values below the critical threshold of 5 (PE: 1.5, EE: 1.8, SI: 1.4 and FC: 2.6). This confirmed that multicollinearity was not an issue in this model.

Path Coefficients

The robustness of path coefficients were determined to assess the proposed hypothesized relationships between constructs (See Figure 5). PE ($\beta = 0.37$) and SI ($\beta = 0.23$) were statistically significant, implying strong impact on BI. Conversely, both EE ($\beta = -0.10$) and FC ($\beta = 0.09$) were statistically non-significant, and had weak impact on BI.

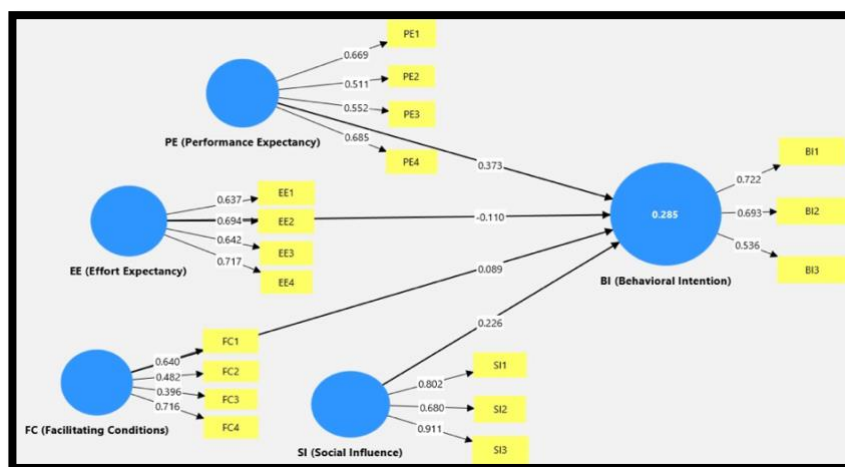


FIGURE 5 – SEM STRUCTURAL MODEL OUTPUT IN SMARTPLS

Source: Ringle, Wende & Becker (2024)

Coefficient of Determination (R^2)

Subsequently, the coefficient of determination (R^2) was determined and reviewed. According to Shmueli & Koppius (2011), the R^2 evaluates the variance expressed in each endogenous construct and hence considered a measure of the respective model's explanatory power. In this model, the R^2 value was 0.285, meaning that the four tested

constructs explain around 28.5% of variance. While there are no strict threshold values for R^2 , this value reflects a moderate level of explanatory power.

Together, the structural model revealed that PE and SI were driving indicators influencing festival attendees BI to use digital tools for enhancing sustainability. The following sub-section provides a detailed analysis and the results of hypotheses testing.

4.1.3 Hypothesis Analysis

The proposed hypotheses were tested using bootstrapping with 5000 subsamples in PLS-SEM through SmartPLS software. Bootstrapping is a resampling procedure used to measure the statistical significance of various PLS-SEM estimates, including t-values, p-values, and path coefficients for testing hypotheses (Ringle, Wende, & Becker, 2024). A path coefficient is considered statistically significant when its p-value is below 0.05 and relative t-value is above 1.96, based on a 5% significance level. Table V presents the hypotheses test results, along with the corresponding bootstrap values.

TABLE V – HYPOTHESIS TEST RESULTS

Hypothesis	Relation	β	P-Value	T-Value	Results
H1	PE $\rightarrow$ BI	0.37	< 0.01	< 2.58	Supported
H2	EE $\rightarrow$ BI	- 0.11	= 0.07	~ 1.80	Not Supported
H3	SI $\rightarrow$ BI	0.23	< 0.05	~ 2.00	Supported
H4	FC $\rightarrow$ BI	0.09	= 0.12	~ 1.55	Not Supported

Source: Ringle, Wende & Becker (2024)

H1: (PE $\rightarrow$ BI): Supported – PE was identified as the strongest predictor of BI confirming that attendees were mainly influenced by digital tools that benefited or enhanced their experience with sustainability efforts.

H2: (EE $\rightarrow$ BI): Not Supported – EE was statistically non- significant, explained by the young digitally literate demographic in the survey respondents

H3: (SI $\rightarrow$ BI): Supported – SI displayed statistical significance, illustrating peer led motivation and social norms as factors influencing adoption.

H4: (FC → BI): Not Supported – FC proved non-significant indicating technical support or infrastructure did not influence attendees BI to adopt digital sustainability.

In general, the quantitative findings suggest that PE and SI are key indicators of digital tools adoption in large-scale event settings such as Boom Festival. This emphasizes the growing importance of integrating digital tools to enhance sustainability in such events.

4.2 Qualitative Results

A total of five interviews were conducted with purposively selected participants from Good Mood LDA - the organizing and production company of Boom Festival. According to Guest, Bunce, and Johnson (2006), thematic saturation in homogeneous groups can often be achieved within five to six interviews, specially when participants possess expert or insider knowledge relevant to the topic of research. Table VI presents introduce the participant roles and their contributions to this study. The purposive sampling ensured that participants possess considerable knowledge of the festival's sustainability initiatives and the digital tools employed. Detailed consent forms were provided before the questions.

TABLE VI – SAMPLE CHARACTERIZATION

P#	Role / Function	Contribution
P1	IT Analyst	Insights on implementation and use of different types of digital Sustainability tools
P2	Environmental Specialist	Develop & oversee current and ongoing sustainability and resource management goals
P3	Lead Volunteer	Perspective from production team viewpoint and direct engagement with attendees
P4	Senior Producer	Provides strategic insight into planning, designing and executing sustainable events
P5	Volunteer	Observes attendees interaction with digital tools and offer assistance if required

4.2.1 Initial Code Formation

The thematic approach began with open coding to identify salient phrases and repeating expressions that remained grounded in participant responses (Braun & Clarke, 2006). Open coding pinpointed recurring concepts such as 'RFID wristbands,' push

notifications,’ and ‘attendee behavior’, which were mentioned often (See Appendix 3). These initial codes were then organized into grouped categories or sub-themes.

Three sub-themes formed from open coding: (1) operational enablers, referring to digital tools aiding efficient operations, (2) behavior catalysts, factors driving engagement behavior among attendees and (3) future innovations, indicating willingness and desire to adopt emerging digital tools in future editions. Figure 6 presents the code-to-theme mapping, linking how final themes were developed from initial open codes.

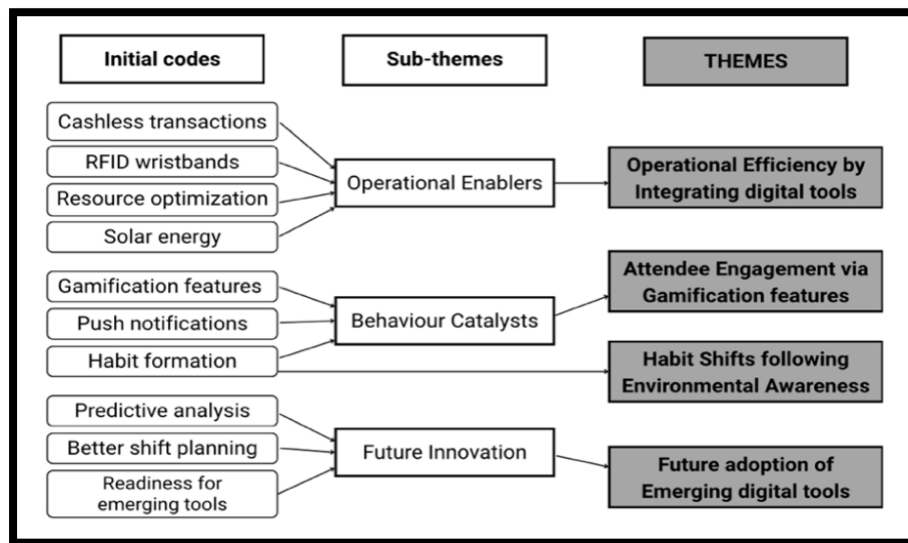


FIGURE 6 – CODE-TO-THEME MAPPING

The sub-themes facilitated broader interpretations, resulting in identification of four overarching themes. This step-by-step approach followed the methodologically validated and rigorous framework proposed by Braun & Clark (2006). Throughout the course of the qualitative analysis, an audit trail was maintained to note and document evidence – from raw responses to initial codes, sub themes, and the final themes – ensuring transparency.

4.2.2 Identifying Themes

The four identified themes from the qualitative analysis reflect Boom Festival’s role in promoting digital sustainability performance. Each theme incorporated direct quotations from interview responses and aligned conceptually with relevant UTAUT2 constructs, hence, strengthening the methodological triangulation across both datasets. The final themes are defined and discussed in the following sub-sections.

Theme 1: Operational Efficiency by Integrating Digital Tools

A dominant theme emerging from the interviews was the role of digital tools - mainly RFID wristbands, IoT sensors, and the Boom mobile application - in improving the operational efficiency of the festival. Participants consistently mentioned that these tools enabled cashless transactions, reduced paper usage, and allowed organizers to optimize resource management through real-time monitoring of consumption.

“The RFID wristbands help us understand and analyze the interaction of the festival attendees’ with eco stations.” (P4)

“...help us measure water level and control it with electric valves to avoid failure at key points.” (P1)

These excerpts demonstrate how digital tools foster sustainability initiatives and improve overall operational efficiency. This aligns directly with the construct of PE, which was the strongest predictor of BI in the quantitative analysis.

Theme 2: Attendee Engagement via Gamification Features

Gamification features in the Boom mobile application appeared as central engagement driver, transforming sustainability initiatives into interactive participant behaviors. The interview responses highlighted the effectiveness of gamified features – such as push notifications and reward-based systems - in motivating eco-friendly practices.

“...a huge queue of people to the compost station after a notification was sent through the Boom app...many people are curious and ask about it.” (P5)

“The Boom app has helped us reduce the amount of paper usage and teaches boomers practices like recycling and the impact they have in this ecosystem.” (P2)

Attendees were rewarded with badges and eco-points (see Figure 7) for their involvement in eco-friendly activities through the Boom mobile application. These points could be redeemed for discounted food, drinks, and merchandise available at the festival. This theme reinforces both BI and PE constructs, illustrating how gamified features make sustainable actions more engaging and rewarding experiences, therefore influencing festival attendees to continue using them.

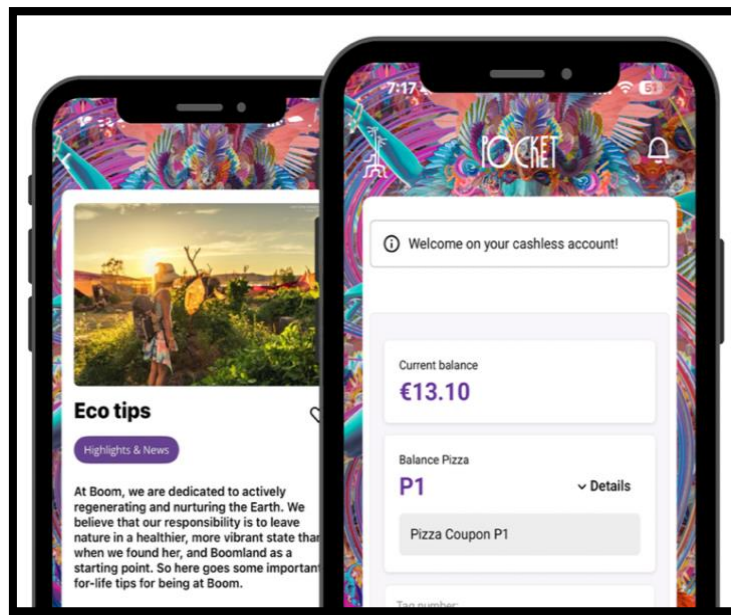


FIGURE 7 – SCREENSHOT OF BOOM MOBILE APPLICATION: 2025 EDITION

Theme 3: Habit Shifts following Environmental Awareness

A prominent pattern observed was the behavior change or attitude shift among attendees as a result of observing existing sustainability measures. Stakeholders pointed out that attendees, especially those of younger age groups, have begun to grasp the consequences of their participation, leading to improved eco-friendly behaviors such as categorizing waste to recycle appropriately and reducing single-use plastics. Such notable feats suggest that adoption of digital tools, combined with Boom Festival's eco-strategy, supports sustainable behaviors and may promote long-term habit formation.

“...have observed changes in behavior of Boomers as they have become more aware of differentiating their waste and using the bins properly.” (P2)

“...our implemented measures for waste sorting motivated them be more responsible...the use of reusable products has gone up among young boomers” (P4)

This theme is consistent with PE, as the visible behavior changes benefit attendees and motivate them to adopt digital sustainability tools. Furthermore, it aligns with BI, considering such habits formed could encourage lasting adoption of digital tools.

Theme 4: Future Adoption of Emerging Digital Tools

The response to the potential integration of emerging digital solutions in future editions was overwhelmingly positive. Almost all respondents emphasized their readiness

to implement latest digital tools, primarily AI, for dynamic resource adjustment and predictive analysis for crowd controlling and better shift planning. These suggestions reflect the willingness to adopt emerging tools that could address current system gaps and improve data driven sustainability initiatives.

“Without doubt, artificial intelligence is the future of sustainable event management...AI to predict and gather real time information will be vital” (P4)

“AI could help us plan our shifts better by predicting rush hour areas like showers or food courts to reduce crowding.” (P5)

These trends reinforced alignment with PE, as participants expect future benefits and demonstrate readiness to adopt advanced digital tools to further promote sustainability performance. Figure 8 presents the thematic map, which visually summarize the progression from the initial codes to the four major themes.

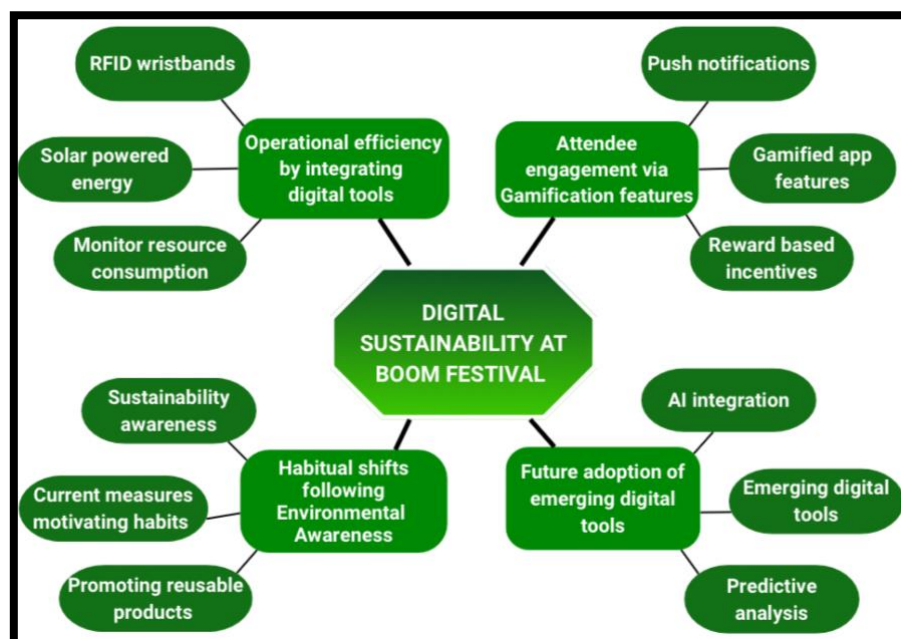


FIGURE 8 – THEMATIC MAP

4.3 Integration of Findings and Triangulation Matrix

The triangulation of findings obtained from quantitative and qualitative analyses indicated varying degrees of convergence across the constructs evaluated in this study. PE achieved statistical significance in the survey analysis ($\beta=0.37$) and was reinforced by qualitative insights signifying the impact of digital tools on efficient operations and

enhancing sustainability. This confirmed strong convergence. SI was statistically significant ($\beta=0.23$) as well. However, the interview responses did not provide direct evidence indicating that SI influence attendees' BI, thus implying partial convergence.

Both EE and FC were statistically non-significant and displayed weak convergence. This contrasts with numerous UTAUT2- applied studies, where perceived ease of use and infrastructural support were found to have critical roles in technology adoption (Dwivedi et al., 2020). However, in the context of this study and Boom Festival, the predominantly young and digitally oriented demographic could explain the weak impact of EE, considering 85% of survey respondents fell in the age group between 18 and 34. Ease of use and technical support may not influence the adoption intention for this age group, since these factors are usually taken for granted than considering critical to them.

Finally, BI recorded a high mean score of 4.10 (see Table VII), influenced by PE and SI. Themes one and three reinforced that engagement was driven by gamification and sustainability awareness, reflecting the influence of PE and SI on BI.

TABLE VII – TRIANGULATION MATRIX

UTAUT2	Quantitative results	Qualitative results	Triangulation
PE	Significant ($\beta = 0.37$)	Digital tools for efficiency & sustainability	Strong Convergence
SI	Significant ($\beta = 0.23$)	No direct evidence about peer led motivations	Partial Convergence
EE	Non- significant ($\beta = 0.11$)	No mention of ease of use	Weak Convergence
FC	Non-significant ($\beta = 0.09$)	Less mention of technical support / infrastructure	Weak Convergence
BI	Predicted by PE & SI (Mean = 4.02)	Engagement by gamification & awareness	Reinforced (Theme 1&3)

The triangulation matrix found strong convergence for PE among both data sets, depicting enhanced experience or benefits of attendees were more influential in their adoption of digital sustainability tools over ease of use, social norms, or technical support.

The following chapter five details key findings resulting from the mixed-methods analysis, underscores the theoretical and practical contributions of this study, and concludes by presenting its limitations, together with suggestions for future research.

5. DISCUSSION AND CONCLUSION

5.1 Key Findings

By adopting a convergent mixed-methods approach, this dissertation examined how emerging digital tools enhance sustainability performance in large-scale cultural events- using Boom Festival in Portugal as the case study. Findings from both quantitative data, through an online survey and qualitative data, analyzed thematically, drew insights reflecting the environmental and social benefits of technology adoption in large-scale events like Boom Festival. This research was structured around three primary questions:

RQ1: How do emerging digital tools enhance sustainability in large-scale cultural events?

The results from both datasets consistently highlighted the importance of digital tools in advancing overall sustainability through efficient operations and by influencing behavioral outcomes of festival attendees. The survey analysis revealed that PE and SI were statistically significant and primary indicators influencing attendees' behavioral intentions to adopt digital tools aimed at promoting sustainability. PE emerged as the strongest predictor ($\beta = 0.37, p < 0.01$), suggesting that attendees are more willing to use these tools when they perceive that the tools enhance their experience, while contributing to eco-friendly practices. This notion is consistent with previous studies, which identifies perceived usefulness as the strongest predictor of technology adoption, extending its relevance to the sustainability domain (Venkatesh et al. 2012). Therefore, festival attendees' decisions to use digital tools are motivated not only by the perceived personal benefits, but also to actively engage and contribute to collective environmental goals.

The qualitative results further complemented these findings, as interviewees frequently emphasized the benefits of digital tools - RFID wristbands, Boom mobile application and QR codes - which support quicker check-ins, cashless transactions, and swift access to digital information on attendees' devices. In addition, IoT-enabled solutions such as smart bins and water refill stations allow for real time monitoring and tracking of resources, providing actionable data guiding organizers toward timely and informed decision-making. The combined benefits of these tools promote overall sustainability by improving resource management and attendee engagement. Overall, these findings identified the vital role of digital tools in enhancing sustainability at large-scale cultural events like Boom Festival, thereby answering the first research question.

RQ2: How do these tools optimize use of resources such as waste, water and energy?

The effective execution of resource management at Boom Festival to lower the overall carbon footprint through improved waste management, water consumption and energy efficiency, is indicative of its adoption of digital strategies. For instance, the festival uses categorized recycling methods by separating different types of waste and converting a significant portion of it into organic compost. The integration of solar panels to reduce energy consumption, alongside digital monitoring systems that optimize water consumption are some key initiatives adopted by Boom Festival to reduce greenhouse emissions. In addition, the use of Boom mobile application and QR codes support digital access to all kinds of information, virtually eliminating the need for printed material. These strategies align with existing literature reviewed in this study, demonstrating how data-driven digital tools foster sustainable event management (Jones, 2017). This collective approach reduces the festival's carbon footprint and further improves its resource conservation efforts – impacting water, waste, and energy – addressing the second key research question.

RQ3: How do these tools influence attendee's engagement with sustainability practices?

SI was another key predictor that achieved statistical significance following the survey analysis ($\beta = 0.23$, $p < 0.05$), signifying the role of peer actions, social norms and collective engagement in community practices like waste sorting and recycling. This indicated that festival attendees began displaying eco-friendly practices, not only driven digitally, but also because of improving sustainability awareness shaped by eco-strategies employed by Boom Festival. A consistent motivating factor identified in this study was the impact of gamification features - push notifications and reward-based systems through the Boom mobile application - nudging attendees toward eco-friendly behaviors. This underscores the role of digital tools in both operational efficiency and promoting sustainable practices among attendees – addressing the final research question.

Since both EE and FC revealed weak and non-significant impacts, the methodological triangulation suggested a unique approach, where technology adoption was not influenced by ease of use or technical support, but rather by expected benefits perceived by attendees.

5.2 Research Contributions

Theoretical Contributions

This research broadens the scope and applicability of the UTAUT2 as a conceptual framework by contextualizing it in a large-scale event setting, which was a previously under - explored area (Venkatesh et al., 2012, Hair et al., 2019). The results validate UTAUT2's robustness as a behavioral model for predicting technology adoption in non-organizational settings. This work builds prior studies on technology adoption by demonstrating that the model's constructs continue to succeed even in non-organizational, temporary environments, especially in large-scale event settings such as Boom Festival.

The mixed-methods triangulation approach reflects the importance of combining quantifiable data and qualitative insights to offer in depth analysis of the impact of digital-tool driven BIs for sustainable outcomes. The findings lay groundwork for future studies about the growing potential of emerging digital tools like AI to promote sustainability initiatives and improve behaviors aligned with environmental impact, therefore establishing a theoretical bridge between digital innovation and sustainability literature.

Practical Contributions

This study provides event organizers with actionable guidance by providing a roadmap for enhancing operational sustainability. The findings highlight the necessity of integrating digital tools with high perceived utility, such as RFID technology and IoT sensors, to optimize resource management. This corresponds with sustainable event management solutions by Chen and Yu (2024) & Carrilho (2023), therefore minimizing technology-integrated minimizing carbon footprint and enhancing off-grid management.

Furthermore, the study exhibits ways to engage festival attendees through behavioral nudging tools like gamified features and promoting sustainable awareness. These are strategies that are relevant and can be replicated by similarly influential large-scale events to promote sustainable goals and behaviors (Thaler & Sunstein, 2008).

This research provides empirical evidence that digital tools support circular resource management and advance key SDGs discussed in chapter two: explaining SDG 13 by carbon footprint reduction through emerging digital tools, SDG 12 by engaging in recycling and waste management practices, and SDG 11 by promoting community level participation. Drawing on examples from Boom Festival that highlights their potential to

enhance sustainability, this offers a guiding principle for event planners on the significance of digital tools to improve operational efficiency and attendee engagement.

Finally, broadening beyond event settings, the findings of this study could shape sustainability policy initiatives such as the European Green Deal and the UN goals, re-establishing the significance of integrating emerging digital tools to address ecological impacts and the rising potential of large-scale events to serve as sustainability laboratories.

5.3 Study Limitations

Despite the valuable contributions, this study has limitations that should be considered for improvements in future research. First, while suffice for the SEM analysis, the sample size was relatively low and consisted primarily of young and digitally literate Boom Festival attendees, limiting the generalizability of the findings. Second, a cross-sectional strategy was used to gain attendee perception from a specific time and based on previous editions of the festival. While efficient in determining BI, it does not identify long-term trends. Third, the dependence on structured interviews with stakeholders having similar perspectives on the topic may have created bias and while valuable insights were gathered, the qualitative methodology hindered broad-ranging applicability.

5.4 Future Recommendations

Future studies on digitally sustainable tools and their impact on large-scale events should incorporate broader sample of survey attendees from diverse demographics, locations, age groups and different levels of digital literacy - to strengthen validity and provide perspectives from various groups and communities. Further, subsequent studies could follow a longitudinal strategy, comparing multiple similar festivals, to comprehend behavioral trends over time - before, during and after the festival. Finally, including external digital and sustainability experts, and incorporating focus groups may help limit potential qualitative biases (Creswell & Poth, 2018). By addressing these concerns, future research can explore and provide richer insights that advance knowledge on this topic.

This study demonstrated that attendees' BI to adopt digital sustainability tools in large-scale events was primarily driven by PE, compared to and more strongly than SI, EE, or FC. To conclude, the findings signify the importance of leveraging emerging digital tools to promote sustainability in large-scale cultural events.

REFERENCES

- Abonamah, A., Hassan, S., & Cale, T. (2025). Artificial intelligence and environmental sustainability playbook for energy sector leaders. *Sustainability*, 17(14), 6529. <https://doi.org/10.3390/su17146529>
- Amini, M., & Bakri, A. (2015). Cloud computing adoption by SMEs in Malaysia: A multi-perspective framework based on DOI theory and TOE framework. *Journal of Information Technology & Information Systems Research*, 9(2), 121-135. <https://ssrn.com/abstract=2841175>
- Ashwin, K. (2023, August 23). The importance of sustainability in event planning. The Event Company. <https://www.theeventcompany.com/news/the-importance-of-sustainability-in-event-planning>
- Atlas.ti. (2025, February 13). The guide to mixed methods research. Atlas.ti. <https://atlasti.com/guides/the-guide-to-mixed-methods-research>
- Atzori, L., Iera, A., & Morabito, G. (2010). The Internet of Things: A Survey. *Computer Networks*, 54(15), 2787–2805. <https://doi.org/10.1016/j.comnet.2010.05.010>
- Baptista, G., & Oliveira, T. (2015). Understanding mobile banking: The unified theory of acceptance and use of technology combined with cultural moderators. *Computers in Human Behavior*, 50, 418–430. <https://doi.org/10.1016/j.chb.2015.04.024>
- Beamian. (2023). Enhancing the festival experience with RFID ticketing. Beamian. <https://beamian.com/enhancing-the-festival-experience-with-rfid-ticketing/>
- Bhatt, G. D., & Emdad, A. (2025). Blockchain's role in environmental sustainability: Bibliometric insights from scopus. *Green Technologies and Sustainability*, 3(4), 100236. <https://doi.org/10.1016/j.grets.2025.100236>
- Boom Festival. (2025). Boom eco paradigm. <https://boomfestival.org/boom-eco-paradigm>
- Bounds, D. (2024, January 29). Why the events sector needs to prioritise the UN SDGs. Meetings & Incentive Travel. <https://mitmagazine.co.uk/Meetings/CSR/Why-the-events-sector-needs-to-prioritise-the-UN-SDGs>

- Bowkis, G. (2024, December 9). Sustainable events: How event apps reduce environmental impact. Guidebook Blog. <https://blog.guidebook.com/mobile-guides/sustainable-events-event-apps-environmental-impact/>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Chen, Z., & Yu, T. (2024). Festivals and digitalisation: A critique of literature. *Tourism Critiques: Practice and Theory*, 6(1). <https://doi.org/10.1108/trc-05-2024-0022>
- Duong, C.D., Vu, T.N., & Viet, T. (2023). Applying a modified technology acceptance model to explain higher education students' usage of Chat GPT: A serial multiple mediation model with knowledge sharing as a moderator. *The International Journal of Management Education*, 21(3), 100883. <https://doi.org/10.1016/j.ijme.2023.100883>
- Creswell, J. W., & Plano Clark, V. L. (2017). *Designing and conducting mixed methods research*. (3rd ed.). Sage.
- DeJonckheere, M., Vaughn, L. M., James, T. G., & Schondelmeyer, A. C. (2024). Qualitative Thematic Analysis in a Mixed Methods Study: Guidelines and Considerations for Integration. *Journal of Mixed Methods Research*, 18(3). <https://doi.org/10.1177/15586898241257546>
- Dwivedi, Y. K., Rana, N. P., Tamilmani, K., & Raman, R. (2020). A meta-analysis based modified unified theory of acceptance and use of technology (meta-utaut): A review of emerging literature. *Current Opinion in Psychology*, 36, 13–18. <https://doi.org/10.1016/j.copsyc.2020.03.008>
- E-Tag RFID Singapore. (2025, March 11). The environmental benefits of RFID in recycling. E-Tag RFID Singapore. <https://e-tagrfid.com/the-environmental-benefits-of-rfid-in-recycling/>
- Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research*, 18(3), 382–388. <https://doi.org/10.2307/3150980>
- Goncalves, M. (2018, July 29). A new experience at Boom Festival. Beamian. <https://beamian.com/a-new-experience-at-boom-festival>

- Gordon, T. (2024, July 31). How much waste is leftover after a music festival? Willshees.
<https://www.willshees.co.uk/news/how-much-waste-is-leftover-after-a-music-festival>
- Gretzel, U., Sigala, M., Xiang, Z., & Koo, C. (2015). Smart tourism: Foundations and developments. *Electronic Markets*, 25(3), 179–188.
<https://doi.org/10.1007/s12525-015-0196-8>
- Guest, G., Bunce, A., & Johnson, L. (2006). How many interviews are enough? An experiment with data saturation and variability. *Field Methods*, 18(1), 59–82.
<https://doi.org/10.1177/1525822X05279903>
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, 31(1), 2–24.
<https://doi.org/10.1108/EBR-11-2018-0203>
- Hamari, J., & Koivisto, J. (2015). Why do people use gamification services? *The International Journal of Information Management*, 35(4), 419–431.
<https://doi.org/10.1016/j.ijinfomgt.2015.04.006>
- Harrington, L. (2018). Eco-friendly events: How beamian supports sustainable events for a greener future. Beamian. <https://beamian.com/eco-friendly-events-how-beamian-supports-sustainable-events>
- Henseler, J., Ringle, M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in structural equation modeling. *The Journal of the Academy of Marketing Science*, 43(1), 115–135. <https://doi.org/10.1007/s11747-014-0403-8>
- Humphries, K. (2021, March 26). Event sustainability: 25 sustainable event ideas for enterprise. SpotMe. <https://spotme.com/blog/sustainable-events/>
- Jones, M. L. (2017). *Sustainable event management: A practical guide*. (3rd ed.). Routledge. <https://doi.org/10.4324/9781315439723>
- Labellink. (2024). How QR codes are advancing environmental sustainability. Labellink. <https://labellink.org/how-qr-codes-are-advancing-environmental-sustainability/>
- Landrini, G. (2025, January 29). Cultural festivals as tools of sustainable innovation and social change. *Consulta Universitaria del Cinema*.

<https://www.consultacinema.org/2025/01/29/cultural-festivals-as-tools-of-sustainable-innovation-and-social-change/>

- Lin, H.F. (2014). Understanding the determinants of electronic supply chain management system adoption: Using the technology-organization environment framework. *Technological Forecasting and Social Change*, 86, 80–92. <https://doi.org/10.1016/j.techfore.2013.09.001>
- Lopes, S. I., Currálo, A. F., Sá, L., & Curado, A. (2024). Refill_H2O: An IoT-enabled smart and sustainable water dispensing ecosystem. In *Lecture Notes in Computer Science*, (pp. 471–481). Springer. https://doi.org/10.1007/978-3-031-54394-4_37
- Nitschke, J. (2023). Realities of the twin-transition: EU research funding, artificial intelligence, and techno-optimism. *Euromemo*. https://euromemo.eu/wp-content/uploads/2023/11/Nitschke_Realities-of-the-Twin-Transition.pdf
- Nowell, L. S., Norris, J. M., White, D. E., & Moules, N. J. (2017). Thematic analysis: Striving to meet the trustworthiness criteria. *International Journal of Qualitative Methods*, 16(1), 1–13. <https://doi.org/10.1177/1609406917733847>
- Olawade, D. B., Fapohunda, O., Wada, O. Z., Usman, S. O., Ige, A. O., Ajisafe, O., & Oladapo, B. I. (2024). Smart waste management: A paradigm shift enabled by artificial intelligence. *Waste Management Bulletin*, 2(2). <https://doi.org/10.1016/j.wmb.2024.05.001>
- Rasoolimanesh, S. M. (2022). Discriminant validity assessment in PLS-SEM: A comprehensive composite-based approach. *Data Analysis Perspectives Journal*. https://www.researchgate.net/publication/356961783_Discriminant_validity_assessment_in_PLS-SEM_A_comprehensive_composite-based_approach
- Ringle, C. M., Wende, S., & Becker, J.M. (2024). SmartPLS 4. <https://www.smartpls.com>
- Saberi, S., Kouhizadeh, M., Sarkis, J., & Shen, L. (2019). Blockchain technology and its relationships with sustainable supply chain management. *International Journal of Research*, 57(7), 2117–2135. <https://doi.org/10.1080/00207543.2018.1533261>
- Shmueli, G., & Koppius, O. (2011). Predictive analytics in information systems research. *MIS Quarterly*, 35(3), 553-572. <https://doi.org/10.2139/ssrn.1606674>

- Slade, E. L., Dwivedi, Y. K., Piercy, N. C., & Williams, M. D. (2015). Modeling consumers' adoption intentions of remote mobile payments in the United Kingdom: Extending UTAUT with innovativeness, risk, and trust. *Psychology & Marketing*, 32(8), 860–873. <https://doi.org/10.1002/mar.20823>
- Sustainstage. (2024). AI-powered festival sustainability. Sustainstage. <https://www.sustainstage.live/>
- Suter, G. (2008). Nudge: Improving decisions about health, wealth, and happiness [Review of the book Nudge, by R.H. Thaler & C.R. Sunstein]. *Integrated Environmental Assessment and Management*, 4(4), 525–526. <https://doi.org/10.1002/ieam.5630040426>
- Tamilmani, K., Rana, N. P., & Dwivedi, Y. K. (2020). Consumer acceptance and use of information technology: A meta-analytic evaluation of UTAUT2. *Information Systems Frontiers*, 23(4). <https://doi.org/10.1007/s10796-020-10007-6>
- The World Bank. (2018). What a waste: A global snapshot of solid waste management to 2050. World Bank. <https://datatopics.worldbank.org/what-a-waste/>
- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology toward a Unified View. *MIS Quarterly*, 27(3), 425–478. <https://doi.org/10.2307/30036540>
- Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012). Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly*, 36(1), 157–178. <https://doi.org/10.2307/41410412>
- Venturi, S., Zulauf, K., Cuel, R., & Wagner, R. (2024). Trash to treasure: Gamification and informed recycling behavior. *Resources Conservation and Recycling*, 215, 108108. <https://doi.org/10.1016/j.resconrec.2024.108108>
- Boom Festival. (2025). Waste & compost. <https://boomfestival.org/environment/waste>

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APPENDICES

APPENDIX 1 – SURVEY CONSTRUCT TABLE

Construct	Items	Scale
Screening	Have you previously attended Boom Festival?	Yes/No
Demographic	What year(s) did you attend?	Options
Demographic	What is your age group?	Options
PE	PE1: Using Boom Festival’s digital tools (e.g., RFID, Boom app) helped me better understand sustainability practices.	1 to 5
	PE2: I find Boom Festival’s digital tools useful for engaging with sustainability initiatives.	1 to 5
	PE3: The digital tools made sustainability-related tasks quicker (e.g., finding water refill stations)	1 to 5
	PE4: I feel empowered to reduce my environmental impact using these tools.	1 to 5
EE	EE1: Learning to use Boom Festival’s digital tools was easy for me.	1 to 5
	EE2: I was able to interact and use the tools without requiring much assistance.	1 to 5
	EE3: The tools were simple and intuitive to use.	1 to 5
SI	SI1: People around me encouraged my use of digital tools for sustainability at Boom Festival.	1 to 5
	SI2: Noticing others actively using the tools influenced my decision to use them.	1 to 5
	SI3: Talking with my peers at Boom made me feel I should use digital tools for sustainability.	1 to 5
FC	FC1: I had reliable access to resources (e.g., Wi-Fi, charging stations) at Boom Festival to use these tools.	1 to 5
	FC2: I had necessary knowledge to effectively use digital tools.	1 to 5
	FC3: The digital tools used were compatible with my device.	1 to 5
	FC4: Technical support was available for tool usage when needed.	1 to 5
BI	BI1: I intend to use digital tools again in future editions of Boom Festival that promote sustainability.	1 to 5
	BI2: My experience with these tools has positively influenced my sustainability mindset and I will continue using them.	1 to 5
	BI3: I plan to use these tools frequently and would like to see further digital innovations implemented at Boom Festival.	1 to 5

APPENDIX 2 – INTERVIEW CONSENT FORM

Thesis Topic: ‘Leveraging Emerging Digital Tools to Enhance Sustainability in Large-Scale Cultural Events: A Case Study of Boom Festival in Portugal’

Researcher: Abdul Azeez Faziludeen

University: ISEG, Universidad de Lisboa

The estimated time to complete this form is 20-25 minutes. Your responses are vital for this research. Please answer each question in as much detail as possible.

Before we begin, I would like to briefly review a consent statement:

“Your participation is voluntary, and you may skip any question or withdraw at any time without giving a reason. Your responses will remain anonymous and used solely for academic purposes and will not include your name or any personal identifiers”

By checking the boxes below, you confirm the following:

☐ I have read and understood the information above

☐ I voluntarily agree to participate in this research

☐ I give permission for my responses to be used anonymously in the thesis

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APPENDIX 3 – INITIAL CODES FORMED

P#	Participant Responses	Initial Codes
P1	“RFID wristbands make the overall experience pleasant for boomers and us...convenient and timeless purchases for them and data monitoring for us”	Cashless transactions, RFID wristband
P4	“could be reduced single use products, solar dance stages and our water consumption techniques that have contributed to sustainability”	Solar energy, Resource optimization
P3	“I was directly involved the waste sorting and compost toilet system...zero water and no organic products toilets are top of our agenda”	Zero water toilets
P2	“give us a real picture about consumption patterns to plan better in the upcoming editions”	Monitor and track water levels
P5	“The toilets are clean and the process of turning human waste to organic soil is a year round process and not only during the festival”	Compost toilets
P5	“was a huge queue of people to compost station after a notification was sent through the app... many people are curious and ask about it”	Gamification features
P4	“push notifications and free eco-points motivating attendees engagement with sustainable practices”	Push notifications, reward system
P2	“The boom app guides recycling practices and educates about our initiatives and offer eco-tips”	Interactive mobile application
P3	“The use of reusable products have gone up.... our measures for waste sorting motivated them towards recycling practices”	Habit formation
P2	“sustainable actions make boomers aware of their impact in this ecosystem”	Sustainable behavior
P2	“Boomers have become more aware about differentiating waste and using appropriate bins”	Environmental awareness
P5	“...AI to help volunteers recognize rush times in shower or food court areas and plan our shifts better”	Predictive analysis for shift planning
P4	“I personally want to know and see how blockchain can support our initiatives...already working towards it in time for the next edition”	Readiness to adopt emerging digital tools

