WPI

GREEN TECH CHALLENGE

Raising Awareness of

The Internet of Green Things

Supplemental Document

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Background

Global warming, among other environmental issues, is a reality and many international organizations worldwide have placed an emphasis on reducing the amount of human influence on this phenomenon. Several efforts have been made with respect to this matter such as advancements in the renewable energy sector, where Denmark has proven to be a key leader. The Internet of Things, a relatively new technology that refers to the interconnection of devices to make processes more efficient, may also pose a solution to environmental problems.

Green Tech Challenge, the sponsor of this project, coordinates training and mentoring programs for green startups, connecting these companies with networking opportunities, and helping create strategic partnerships (Green Tech Challenge, 2016). GTC is also committed to reducing environmental issues and believes the Internet of Things has a potential to do so through energy-saving and environmental monitoring products that many of its affiliated green startups are currently working on (Green Tech Challenge, 2016). Therefore, the goal of this project is to conduct and analyze the effectiveness of an event that will expose the public to this concept and increase its understanding of IoT and its green capabilities to reduce human's negative impact on the environment.

What is the Current Status of Climate Change?

According to an analysis on global surface temperature changes conducted by the Global Institute for Space Studies (GISS), the average surface temperature has risen by over 0.5 degrees Celsius since 2000, shown in Figure 1 (Hansen, Ruedy, Sato, & Lo, 2010). In the last century, global sea levels rose by nearly 17 centimeters (Church & White, 2006) while the Antarctic and Greenland ice sheets have shrunk in mass by up to 152 and 250 cubic kilometers, respectively (NASA, 2017). In addition, since the Industrial Revolution, surface ocean waters have increased in acidity by 30% (PMEL, 2017). This growing body of evidence leaves little doubt that climate change is occurring and that temperatures are rising at a rapidly increasing rate.

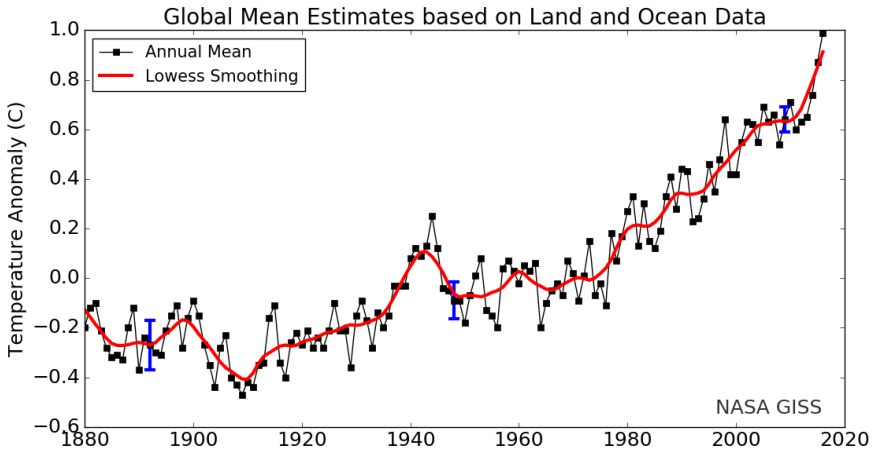


Figure 1: Average Global Temperature (Hansen et al., 2010)

Much of the world's environmental deterioration can be blamed on human activities. Geographer Andrew Goudie argues that humans have diminished the global supply of vegetation by up to 45% in the last 2000 years, and at an even more rapid rate in the last century (Smil, 2011 as cited in Goudie, 2013, pg. 51). By developing lands once uninhabited, human occupation has significantly impacted soil conditions, wildlife populations, water resources, and even the geography of entire landscapes (Goudie, 2013). A large percentage of our world's deterioration occurs within urban environments through pollution (e.g., air pollution from gas emissions and pollution of freshwaters with contaminants), resource depletion (e.g., fossil fuels and other natural resources), and a disregard for the environment as a whole (e.g., not recycling or utilizing non-sustainable materials (Goudie, 2013).

Studies suggest that a leading cause of climate change is from an increasing amount of greenhouse gas concentrations. Figure 2 graphically displays four different emission scenario pathways based on predictions of future economic, social, technological, and environmental conditions. The top pathway predicts the atmospheric concentrations of greenhouse gases if emissions continue under the current trends, predicting values about four times as high as today's value 80 years from now. Such concentrations of greenhouse gasses would a considerable impact on global climate.

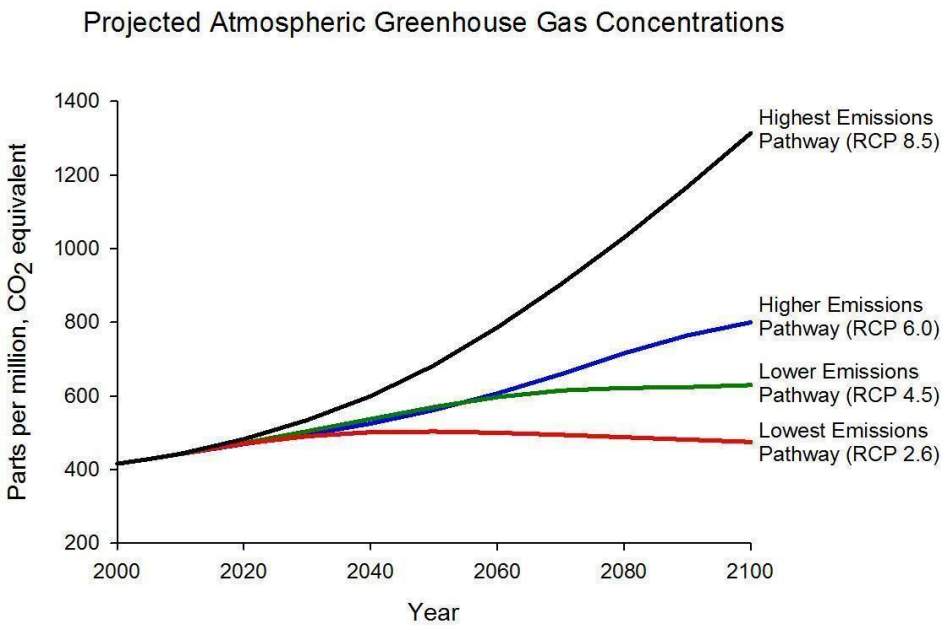


Figure 2: Greenhouse Scenario Projections (Representative Concentration Pathways Database, 2017)

What is Being Done to Address Climate Change Globally?

International efforts have been made to address global climate change. Twenty-five years ago, the United Nations established the Intergovernmental Panel on Climate Change, tasked with publicizing updates on the current status of climate change. In 1992, at the Rio Earth Summit, 166 nations signed the United Nations Framework Convention on Climate Change (UNFCCC), acknowledging humanity's role in global warming (UNFCCC, 2016). The Kyoto Protocol was ratified in 2005, which aimed at reducing the world's emissions of six greenhouse gases by 5.2% by 2012 (UNFCCC, 2016). In 2008, the European Union adopted the Energy and Climate Package that set goals of reducing greenhouse gas emissions, increasing usage of renewable energies, and improving energy efficiencies by 20% by 2020 (UNFCCC 2016). The Green Climate Fund formed at the 2010 Cancun Climate Change Conference aimed at raising $100 billion a year by 2020 to help developing nations in the fight against climate change (Planete Energies, 2016). The Paris Agreement entered into force in 2016 and encourages all nations to work together and pledge their respective countries to solve the global climate issues through financial frameworks, new technology frameworks, and capacity building frameworks (UNFCCC, 2016). Hundreds of nations recognize the necessity for working together to cut down human impacts on the environment.

Denmark has been a global leader in these efforts. In 2006, the Danish government set a goal of becoming fossil fuel free by 2050 (IEA, 2017), known as the Energy Strategy 2050. Between 1980 and 2010 alone, the share of renewable energy rose from 3% to 19%, with a projected value of 33% by 2020 (Denmark, 2017b). The strategy aims at producing energy without

the use of fossil fuels, excluding nuclear power from this category. While this goal may seem to be costly to the Danish consumers, the conversion is funded through feed-in-tariffs paid by inhabitants using electricity (Denmark, 2017a). In addition, as efficiencies of renewable energies increase, the cost to consumers is dropping, making it a viable option for all Danes to adopt. In order to accomplish the goal, Denmark has focused on utilizing and developing greener technology.

How Have Technological Advancements Promoted a More Sustainable World?

Anthropocentric industrialization continues to place stress on the condition of common goods, however, notable efforts are underway to alleviate some of that stress by developing and implementing new technology. One key example is the advancement made by the renewable energy sector to alleviate dependency on fossil fuels and Denmark is a key player in implementing these alternative energy sources.

Currently, Denmark exploits renewable energy to power over 40% of their electric grid with a goal of having 100% renewable electricity by 2035 (Guevara-Stone, 2016), which would keep Denmark on track of accomplishing the mission of the Energy Strategy 2050. With high wind speeds nationwide (Guevara-Stone, 2016), wind power is a viable environmental and economic option as a source of electricity. Wind power offers a reliable source of energy, since, as an indirect form of solar energy, it is always being replenished by the sun (Kristinsson & Roa, 2008). In 1991, Denmark became the first country to construct immense offshore wind farms (Guevara-Stone, 2016). As of January 1, 2016, five offshore wind farms were in operation, as well as over 300 onshore wind turbines bringing total wind capacity to 5,070 megawatts per year (Guevara-Stone, 2016). Other forms of renewable energy used include solar power (e.g., through solar panels), hydropower, biomass and geothermal energy. In 2010, the Danish government implemented net metering to incite home and business owners to utilize solar photovoltaic power systems (PV systems) (Gerdes, 2012a). Net metering allows PV system owners to sell produced surplus electricity back into the public energy grid, making it favorable for consumers to install these systems. Initially, Denmark targeted 200MW of solar energy by 2020, but this number was met by 2012, largely due to the subsidies the government provided in return for using PV systems (Gerdes, 2012a).

What is the Internet of Things?

The technology industry offers great potential in slowing climate change. The executive chairman of the World Economic Forum, Klaus Schwab, has described what he believes is the Fourth Industrial Revolution “characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres” (Schwab, 2016). A byproduct of this revolution is a new concept in the technological world known as the Internet of Things, which offers the potential to expand environmental conservation efforts enormously. The European Research Cluster on the Internet of Things (IERC) and the International Telecommunication Union (ITU) define the Internet of Things (IoT) as “a dynamic global network infrastructure with self-configuring capabilities based on standard and interoperable communication protocols where physical and virtual ‘things’ have identities, physical attributes, and virtual personalities, use intelligent surfaces and are seamlessly integrated into the information network” (Vermesan, Friess, 2014, p. 3). Essentially, IoT technology is the integration of devices or products with the ability to connect to the Internet, enabling real-time data collection, analysis, and assessment to occur autonomously, as visualized in Figure 3.

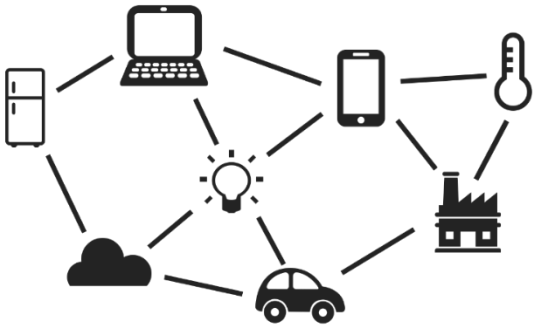


Figure 3: The Internet of Things visualization

Through embedded systems and/or sensors, IoT devices are able to communicate with other devices and sense the environment around them, enabling them to react in specific ways. For example, an IoT enabled light switch device can sense room activity to determine if the lights should remain on or be turned off to reduce wasted energy and can also be connected and controlled on a mobile phone. Although the Internet of Things is relatively new technology, many people internationally, both in developed and developing countries, understand the potential Internet of Things technologies offer and have proposed national strategies in discovering more on the topic (Li, Xu, & Zhao, 2015, pg. 245). For example, the European Union created the IoT European Research Cluster (IERC) that sponsored numerous projects relating to IoT research (IERC, 2017). Likewise, in 2014, the U.K. government launched a $60 million IoT program focused on funding research on IoT and created another program called IoTUK which coordinates the

efforts of organizations receiving funding for their research and development (Postscapes, 2014). As a result, many IoT technology applications have been developed that are beneficial for the environment, reduce waste (e.g. energy, emissions), reduce operation costs, minimize manual labor, and increase efficiency.

As an emerging technology, the Internet of Things promises to improve the efficiency of many business areas and thus contribute to significant energy savings. Internet of Things systems can replace the current operational procedures with innovative approaches based on real-time data acquisition and analysis. With the continuing expansion of IoT, multiple domains have come to adopt this emerging technology in diverse ways. Among these areas, Haller et al. (2008) consider the manufacturing, supply chain integrity, energy, health, automotive and insurance industries as the most promising (Haller, Karnouskos, & Schroth, 2008).

How is IoT Applied?

The Internet of Things concept encompasses a wide range of devices that can be classified according to industry application areas of this new technology. The main domains where there is promising development of IoT products, services, and solutions are environmental monitoring, energy, healthcare services, inventory and production management, food supply chain (FSC), transportation, workplace and home support, security, and surveillance (Da Xu, He, & Li, 2014). Of particular relevance to our project are three IoT domains, as shown in Figure 4, which contribute to lessening environmental stresses by reducing consumption of resources, and mitigating wasted assets. These areas are energy, environmental monitoring, and automation.

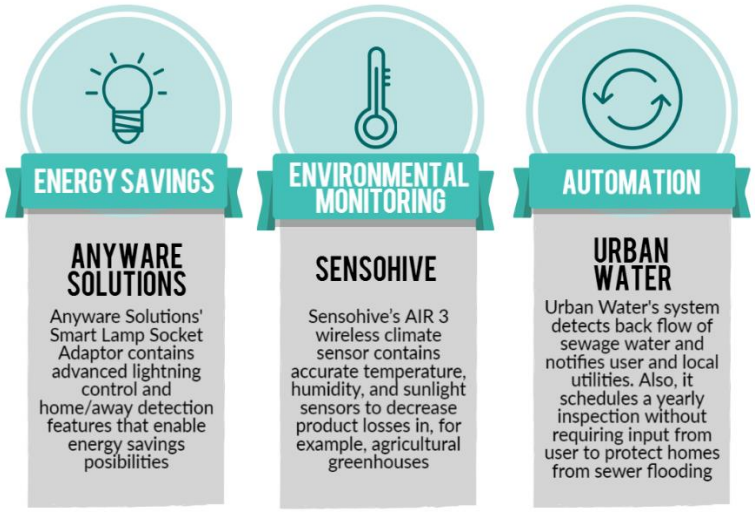


Figure 4: Internet of Things Applications

Energy Savings

IoT concepts offer a variety of innovations to aid in more efficient consumption of energy. As suggested by Haller et al. (2008), one of the most significant examples of the implications of IoT is the creation of an Advanced Metering Infrastructure (AMI). These “smart meters” measure and analyze energy usage from various devices such as electricity, gas, and water meters (Haller et al., 2008). With the introduction of smart meters in households and businesses, real-time data about energy consumption and production will be readily available to influence both the market price and consumer consumption and thus increase energy efficiency. The primary aim of smart meters is to make information on energy consumption more readily available and visible to the consumer so that he or she can better understand the rate of consumption the devices in households or workplaces actually have. The results of a study performed by the journal of cleaner products indicates that, “Smart metering and various consumption-feedback systems can be used as applicable technology to encourage end-use energy efficiency in the residential sector” (Podgornik, 2016). These results suggest a link between awareness of energy consumption rate and amount of energy actually consumed.

A small scale example of the IoT potential in the energy sector is being developed by the Danish startup, Anyware Solutions. This company’s main product is a smart lamp socket adaptor with sound, temperature, humidity, and ambient light sensors that enable it to detect changes in these parameters for the purposes of home monitoring (Anyware Solutions, 2017). This product is directly targeted to individual consumers, and showcases the benefits and amenities that IoT technology can bring to a home by making it “smart.” According to Anyware Solutions, this lamp adaptor allows remote monitoring of the home, indoor climate monitoring, advanced lighting control, and preventative burglar control (Anyware Solutions, 2017). At the same time, its learning algorithms and movement sensors enable energy saving features such as the home/away detection (Anyware Solutions, 2017). When the adaptor detects no people in the house, it will turn off lights that may have been left on, helping to reduce electricity consumption (Anyware Solutions, 2017).

Environmental Monitoring

IoT also promises a positive impact on the monitoring of environmental parameters. A wide range of businesses can benefit from smart sensor devices that not only measure but also allow the user to remotely control parameters such as temperature, humidity, and sunlight. One domain that could benefit from this new technology is the food industry. The current food supply chain (FSP) has become a very complex process with a lot of stakeholders. IoT technologies promise to

trace, visualize, and control the complexity involved in quality management and operational efficiency of the food supply chain (Da Xu et al., 2014). Specifically, sensors and actuators could help control temperature, humidity, and monitor shock or inadequate movement of products during transportation (Atzori, Iera, & Morabito, 2010), which would consequently help reduce food waste. Inadequate transportation is one of the main causes of food waste (Atzori, Iera, & Morabito, 2010). Without adequate refrigeration, dairy products sour and meats rot. IoT temperature sensors could auto-adjust in the case of unexpected temperature variations, reducing losses.

A different example of IoT environmental monitoring is offered by a Danish green startup named Sensohive. The business's products consist of a variety of wireless sensors that communicate and provide data through their own IoT network and cloud service (Sensohive, 2017). Air 1, for example, is a Sensohive wireless temperature sensor designed for storage and distribution processes that require uninterrupted refrigeration (cold chain industry). This product is currently in use at a Danish restaurant, offering real-time measurements of temperature in diverse cooling systems and therefore increasing product quality, decreasing food waste, and improving energy management and temperature documentation (Sensohive, 2017). Similarly, Sensohive's AIR 3 wireless climate sensor has been installed in agricultural greenhouses for accurate temperature, humidity, and sunlight measurements to decrease product losses (Sensohive, 2017).

Automation

In addition to providing information on how to conserve resources, the Internet of Things also incorporates automated devices that are able to act autonomously for the user's benefit. On July 2, 2011 a cloudburst above Copenhagen dropped 150 millimeters of water in just under three hours (CPH Post, 2011), causing around one billion USD in damage to basements and city infrastructure (Gerdes, 2012b). A major source of the damage was due to the sewer systems back-feeding into homes, and the problem often could not be resolved until a week later due to an increased demand for the services of pumping companies (CPH Post, 2011). However, a startup company based in Copenhagen, Urban Water, has designed an automated solution to prevent sewage water from back-feeding into homes. Their system incorporates an IoT solution that can notify the user when the valve is activated and schedule its own inspections (Urban Water, 2016). The system is entirely passive, and when a back-flow is detected, the user and local utilities are notified that flooding has been detected (Urban Water, 2016). Additionally, since inspections are required annually, the system schedules an inspection without requiring input from the user, providing a completely automated system that protects homes from sewer flooding (Urban Water, 2016).

Awareness Among the General Public of IoT

The Internet of Things industry has grown rapidly over the past 10 years, yet still possesses substantial economic growth potential. Forbes magazine recently stated that global spending on IoT products and services reached 120 billion USD in 2016, and expects spending to increase to 253 billion USD by 2021 (Columbus, 2016). While seemingly all economic analysts predict huge growth potential for this industry, many markets, especially in Denmark, are not adopting the technologies at the rate that they could be. A study performed by a global economic strategy firm Monitor Deloitte claims that Denmark is not reaching its potential and is falling short of current global implementation rates of IoT technology (Ericsson, 2016). Deloitte's study showed that only 60% of Danish companies have ongoing IoT initiatives (Ericsson, 2016). However, about 79% of companies around the world claim to be implementing IoT technology in some form (Ericsson, 2016). It is possible that the Danish companies struggle to find where the value of this technology lies. This could relate to a limited demand in the industry for such technology. One way to resolve this issue is to inform the consumers and stimulate a desire for IoT inspired commercial products.

Acquity Group performed an Internet of Things study which surveyed 2,000 U.S. consumers in 2014 regarding IoT and barriers to adopt this new technology. Out of the sample surveyed, most of the consumers, 87%, had not heard of the concept before (Accenture, 2014). These results suggest that a major roadblock to IoT implementation is a lack of awareness among consumers. The same study suggests that a prominent area where consumers will be more interested in will be wearable fitness technology (Accenture, 2014). In fact, 33% of the consumers sampled planned to obtain a wearable fitness device within the next five years (Accenture, 2014). Both the fact that many people are not aware of the term IoT and that their IoT-related interests lie within wearable and fitness technology implies that the full potential of the internet of things remains undiscovered by the general public.

Of particular relevance to our project is IoT's potential to alleviate current environmental issues through devices that promote energy-savings, waste reduction, water consumption control, or other capabilities. Some of these "green IoT" devices can be characterized as in-home technologies (e.g. smart lamp socket adaptors or water consumption meters). According to Acquity's group study, 40% of consumers did not know these in-home technologies were available for purchase (Accenture, 2014). Therefore, it is evident that there exists a need for raising the level of education and interest the public has regarding IoT devices and more specifically their potential to positively contribute to current environmental problems.

Similarly, in Europe, a study carried out by Allensbach Institute in 2015 interviewed 1,393 people and consisted of a representative sample of the German population starting at age 16. This

study showed that 88% of the population heard the term “Internet of Things” for the first time during the interview (Deutsche Telekom, 2015). Furthermore, from the 12% that had heard the term IoT before, only 28% connected the term with the idea of “machines that communicate with each other - self-control of machines” (Deutsche Telekom, 2015). The other part of this 12% of the population related it to different ideas, but 14% (of the 12%) gave a wrong definition of IoT and 21% (of the 12%) did not know what it meant or gave no explanation for the term (Deutsche Telekom, 2015).

This evidence suggests that only a small part of the general public knows what IoT means and of this population, a majority had a high level of education (Deutsche Telekom, 2015). This could imply that science related students and professionals were the part of the population that constituted the 12%. However, of those who had heard of the term, only a small fraction could concretely define IoT and its applications. This suggests a lack of awareness about specific green IoT applications among the general public. In fact, the study also asked the entire population whether they had heard about specific current or future technical developments (Deutsche Telekom, 2015, p.16). Within the different options, some green IoT applications were listed, including one that read: “garbage bins automatically inform the garbage collection when they need to be emptied” (Deutsche Telekom, 2015, p.16). Only 10% of the total population indicated they had heard of this application (Deutsche Telekom, 2015, p.16). Similarly, low percentages of interviewees had heard of the other environmental--related IoT applications listed in the interview question (Deutsche Telekom, 2015, p.16).

Possible Strategies to Raise Awareness of IoT

Currently, the most prominent source of public exposure to IoT technology is from conferences, expositions, and festivals. Each year various companies around the world host large public events in order to introduce consumers to the latest advancements in this industry. “In the U.S. alone, roughly 225 million people annually attend more than 1.8 million events sponsored by companies and associations, including 270,000 conventions and 11,000 trade shows” (Doubledutch, 2015, p. 7). These high levels of attendance are a clear indicator that general-audience events are an effective marketing strategy for promoting new concepts or newly-released products.

These conferences, expositions, and festivals connect companies with consumers by allowing companies to present their latest IoT technologies to the public in the form of conferences, keynote speakers, poster presentations, and interactive workshops. These events stimulate growth by exciting the public and exposing customers to new companies. In coming together, companies can network, share ideas, and create new collaborations. Copenhagen hosts

a yearly “Tech Fest” during the month of September that addresses different strategies of presenting innovative technologies to companies and citizens (Copenhagen Tech Fest, 2016). Throughout September, different companies or organizations host a variety of events including social media campaigns, presentations, conferences, summits, travelling information booths, showcases, talks, networking events, and festivals. Figure 5 demonstrates some of the chosen strategies that could be useful in raising awareness about IoT.

Figure 5: Methods to Raise Awareness about Internet of Things

According to Stelzner (2011), 93% of companies use social media as a marketing tool. Social media has been identified as the most cost-effective strategy used by businesses to advertise and promote their products and services after the global recession of 2008 (Kirtiş, & Karahan, 2011). Besides the relatively low cost this strategy implies, social media has also significantly increased brand exposure and awareness and improved customer relations in the form of better feedback collection processes and faster communications (Jussila, Kärkkäinen & Leino, 2011).

The most commonly used social media tools, according to the percentage of marketers that use each tool, are Facebook (92%), Twitter (84%), LinkedIn (71%), Blogs (68%) and Youtube (56%) (Stelzner, 2011). Each of these tools has specific features and functionalities that differentiate it from the rest and therefore, according to specific objectives or intentions, one may prove more valuable than the others. If this strategy was to be chosen to achieve this project’s mission, it would then be necessary to carry out a complete analysis on the different benefits that each individual tool would contribute to the overall campaign strategy and draft out specific objectives that would be achieved by means of each social media tool.

Presentations can be used for a variety of purposes ranging from relaying information to a general audience, to training employees of a company, to enhancing a business' public image. In addition, presentations can utilize a variety of tools such as hands-on demonstrations, graphic figures, visual and audio components (e.g. a video), or a multimedia combination of tools. Presentations can be targeted towards specific demographic groups or have a more general audience focus (Kogon, K., England, B., & Schmidt, J., 2015).

Conferences are typically formal events attended by professionals working in the industry (Matthes, 2016). Representatives from different corporations present on industry specific topics and are typically used to gain more information about the industry (Matthes, 2016). Although some conferences are open to the public, attendance is typically targeted towards industry professionals and is beyond the target group for this project.

Copenhagen Maker was one of the Tech Fest sponsors that organized a festival. This sponsor is formed by a group of startups, nonprofit organizations, and associations from different fields. The festival had different events taking place, which functioned as different strategies to present technological advances to the Danish community. The events focused on workshops, showcases, and talks. The main purpose of these activities was to "celebrate maker culture, technology, and do it yourself trends as well as innovation and co-creation," (Copenhagen Maker, 2016). These celebrations resulted in relaying practical skills and successfully engaging participants through interactive workshops raising awareness about new technology and cultural trends.

A demonstration center is typically a physical space where several example applications of the technology are set up. Visitors are able to come to the space and interact with the demonstrations that have been constructed, while also interacting with representatives that can provide more information. As an example, National Grid has set up a "Sustainability Hub" in Worcester, Massachusetts to demonstrate specific technologies that reduce energy consumption. The hub is open to the public for tours during the workday, and occasionally hosts sustainable energy events. After visiting the space, several examples of energy saving technologies are set up in a mock kitchen to provide hands-on demonstrations to visitors, and infographics are placed on empty walls. These types of places are targeted towards the public, and help provide concrete examples of implementations to generate excitement about the technology. Having the space open during the week lowers barriers for public access, and hosting events helps bring in people that would otherwise not attend.

An alternative to hosting an event that consists of multiple activities and speakers, awareness can also be spread by creating a booth and attending local and international events. This is an inexpensive option of informing the public of potential IoT applications across a range of

demographics. Di-Anne Di Re (2012), a marketing expert from eHow Finance, describes the value and impact a vendor booth can have. Di Re states, “For many vendors, shows and expos are a crucial element in their marketing strategy” (Di Re, 2012). Having a regular booth allows a vendor to travel from location to location, presenting at expos, and spreading awareness and interest in their product. Peter Symonds, a representative from Smart Insight Marketing Advice, analyzes some specific benefits of exhibiting a product at a trade show. He explains, “exhibiting at a trade show has hundreds of benefits for your business. Establishing a presence, whether big or small, for your company at a trade show gives you a powerful platform for meeting new customers, reaching out to your existing clientele, and building a more established and reliable brand” (Symonds, 2014). Some of the specific advantages he references include generating lucrative business leaders by learning what works and what doesn’t in order to develop and strengthen the company’s brand (Symonds, 2014). The ability to combine interactive demonstrations and interpersonal dialogue can lead to an inspirational and educational experience for both the customer and the presenter.

Our Strategy for Raising Awareness

Among these diverse ways of exposing the public to new concepts, one popular strategy is hosting festivals, in which participants such as startups, nonprofit organizations, companies, and associations with a common interest organize an event focused on workshops, showcases, and talks. This type of event aims to engage participants to raise awareness and understanding of the new IoT technology through fun and creative activities. With many options available, Green Tech Challenge has selected the festival approach to expose the public to green applications of IoT, and increase public exposure for startups in the industry. Although festivals have been implemented by other groups before, very few have had approaches for assessing the effectiveness of the event in transferring knowledge and impacting the opinions of the public. Previous assessment approaches have only assessed quantitative metrics of the attendees, such as the number of participants registered, which industry the attendee was employed in, and operating budget of participating corporations (Smart IoT London, 2016).

Objective 1 · Develop Criteria to Assess the Success of the Event

In order to develop accurate criteria to assess the success of the festival in terms of being an effective method of raising awareness of IoT and its green applications among attendees, we used

a three-step approach. The ultimate purpose of this approach was to arrive at a final list of indicators that altogether would allow us to firstly, define what would constitute success for this event, and secondly, determine whether the event reached its goal of raising awareness of IoT.

The first step of the approach was to identify and subcategorize the key factors of the festival our team was attempting to assess during the event. These were identified as the criteria we would use to address to determine event effectiveness. Once these were identified, we proceeded to develop specific indicators for each criterion identified in step one to act as a guideline for determining what would constitute success for each criterion. The final step was then to develop operational definitions of success (ODS) for each indicator and each criterion that would allow our team to conclude if the criterion was met and if the event was successful overall. Altogether, the criteria were the general principles we addressed during assessment, the indicators detailed how each criterion should be evaluated, and the operational definitions of success designated the standard each indicator and criterion should meet in order to be considered successful.

In order to carry out this three-step process for developing the final set of criteria for event assessment, we used a combination of reasoning based on our prior knowledge and based on conversations with our sponsor, to identify the specific criteria necessary for determining the event's success. First, our team met several times and developed an initial set of criteria with corresponding indicators using our prior knowledge of IoT. Second, in order to supplement our criteria and expand upon our indicators, we conducted informal discussions with our sponsor Frederik van Deurs, co-founder of GTC, so that his expectations for the festival would also be reflected in the assessment tool. The informal discussion protocol followed is detailed in the next section. Finally, our team integrated our initial set of criteria with the recommendations and expectations Mr. van Deurs had for the festival to produce the final set of criteria that would be used for assessing the effectiveness of the festival in awareness of raising IoT.

Design of Informal Discussion Protocol with Frederik van Deurs from Green Tech Challenge to Develop Event Criteria

Note: The numbered questions are research questions and within each numbered question are the corresponding discussion questions marked with a letter at the beginning.

Discussion preamble: Hello Mr. van Deurs, we would like to discuss with you the goals you envision for this festival and the criteria the event should meet to be successful. Before we begin with the discussion questions, we would like to ask if you agree with us recording this conversation. In addition, can we use your name in our final report if we choose to include this specific discussion?

1. What indicators does GTC consider useful for measuring event impact?
    a. What is the expected festival attendance? What age group or specific population group should be the target for the event?
    b. How many participating companies should there be in the event?
    c. How should the press and media coverage of the event look like?
    d. What types of visual materials will be used for advertisement?
    e. Should participating companies be advertised as part of the general festival advertisement?
    f. Are there any other goals you envision this festival should meet?

How the information would help accomplish the objective:

Understanding what the sponsor's expectations for the event logistics helped us develop additional event guidelines to follow in order to improve the chances of success for the festival in terms of attendance, media coverage, and attendees' level of satisfaction.

2. What are Mr. van Deurs' expected outcomes from the festival with respect to the attendees' knowledge of and interest in IoT and its applications?

    a. What knowledge do you want participants to walk away from this event with?
    b. Do you expect participants to be able to explain green IoT applications after the event? How many different applications or product examples should they be able to mention?
    c. Are you interested in knowing whether the participants' interest in IoT and its green applications has increased? (e.g. in the form of desire to buy IoT products, desire to work within the IoT industry, desire to develop more IoT green solutions, etc.)
    d. Are you interested in asking the participants for their feedback on the event, possible improvements and what they specifically liked about the event and what they found most helpful?
        i. Would you want quantifiable evaluations?

How the information would help accomplish the objective:

This information was useful for understanding what the sponsor's expectations were in terms of IoT knowledge and interest of attendees as a result of having participated in the festival. Therefore, this information was used for making the necessary adjustments or additions to the set of indicators developed previously by our team for assessing the success of the festival.

Objective 1 Results

Initial Set of Criteria for Event Assessment Developed by Our Team

In order to produce an initial version of the event assessment tool, we first decided to subcategorize our criteria into three areas that would allow us to better explore different key aspects of the event that, if correctly addressed, would indicate that the event was successful. These three subcategories of the criteria were (1) attendees' knowledge of IoT post-event, (2) attendees' interest in IoT post-event and (3) attendees' level of satisfaction with the event. Subsequently, we developed operational definitions of success for each criterion along with sets of indicators that were used to determine whether success was achieved in each separate criterion, or more generally, to determine whether the event raised levels of knowledge of IoT and interest, and at the same time, was an enjoyable and entertaining way to do so.

As a group, we decided that both knowledge and interest were integral components of the general term "awareness." Therefore, including these two subcategories was necessary to perform a thorough analysis on whether awareness was raised of IoT and its green applications. Furthermore, we determined that in order for this event to be fully successful, participants whose knowledge of IoT was increased should also indicate a high level of satisfaction with the event logistics and activities. By attempting to organize an appealing and interesting event, we hoped to stimulate interest that would result in continued research after the festival and to increase the likelihood of the public attending similar events. The purpose of this inclusion was also to collect enough information to be able to give recommendations to stakeholders on effective IoT-related activities for engaging with the public.

Criterion 1. Attendees' knowledge of IoT post-event

With respect to criterion number one, we used our prior knowledge of IoT to develop three indicators that, if met, would constitute success. The operational definition of success (ODS) for criterion one was having over 50% of the knowledge indicators met or, in this case, having at least two indicators met.

To identify positive changes in knowledge of IoT and its green applications as a result of participation in the event, we identified that participants should:

Indicator a. Give additional examples of IoT products with green applications after attending the festival.

ODS: Have over 50% of the attendees move up one classification[1] in terms of the green products they could mention

Indicator b. Give a complete or more thorough definition of IoT

ODS: Have over 50% of the attendees move up one classification[1] in terms of the definition of IoT given

Indicator c. Perceive a positive increase in their knowledge of IoT as a result of having attended the festival.

ODS: Have over 50% of the attendees should also indicate that their perceived level of IoT knowledge increased by one point on a scale of 1-5

For indicator a., we determined that attendees should be able to give more examples of IoT products with green applications than they could before coming to the event. For indicator b., we identified the keywords we consistently found during our research about IoT consisting of connectivity or networking, sensors or hardware, software, data collection, and analysis and concluded that a complete definition would contain all key terms. For indicator c., we believed that attendees should perceive that their knowledge of IoT increased.

Criterion 2. Attendees' post-event interest in IoT

In terms of criterion number two, we decided that increased IoT interest could be shown through attendees' positive opinions regarding products showcased in the event, desire to acquire more information on IoT products and/or desire to attend similar events. The operational definition of success (ODS) for criterion two was having over 50% of the interest indicators met or, in this case, having both indicators met.

To identify positive impacts on general interest in IoT as a result of participation in the event, we identified that participants should

Indicator d. Express a desire to attend similar events in the future to continue learning about IoT.

[1] The operational definition of success for indicators a. and b. was having over 50% of the attendees move up one classification in regard to the indicator. This operational definition was applied to the data tools developed in Objective 3 results. The possible classifications for attendees' knowledge of IoT were barely to non-knowledgeable, moderately knowledgeable, highly knowledgeable and completely knowledgeable and our assessment approach for knowledge of IoT is detailed in the rubric tool that we developed to evaluate attendees' change in knowledge in the section entitled "*Scoring rubric for evaluating pre-event interview responses*" within Objective 3 results.

ODS: Have over 50% of the attendees either strongly agree or somewhat agree with wanting to learn more about IoT and its green applications

Indicator e. Express the intention of acquiring more information on IoT and its green applications.

ODS: Have over 50% of the attendees be either extremely or somewhat likely to attend similar events in the future.

Criterion 3. Attendees' level of satisfaction with the event

In terms of criterion number three, we decided that satisfaction with the event would also constitute success and enable our team to make recommendations for future IoT events. The operational definition of success (ODS) for criterion two was having over 50% of the satisfaction indicators met or, in this case, having at least two indicators met.

To identify high event satisfaction from the participants after having attended the festival, we identified that participants should

Indicator f. want to attend this event in the future

ODS: Have over 50% of the attendees be either extremely or somewhat likely to attend this event in the future

Indicator g. be satisfied with the methods that companies used to present information about their products and IoT

ODS: Have over 50% of the attendees indicate high levels of satisfaction with companies' booths

Indicator h. Agree the festival was an effective method to learn about IoT and its green applications

ODS: Have over 50% of the attendees strongly agree or somewhat agree with the festival being an effective method for IoT learning

Results of Discussions with GTC Co-founder, Frederik van Deurs

During our informal discussions with Frederik van Deurs, he communicated to us additional event aspects to assess in terms of event organization and participants' post-event awareness of IoT. These additional aspects are detailed below. The aspects that we determined would benefit our research were included into our final criteria for assessing the success of the event. As a result

of these conversations, we also obtained additional goals for our festival in terms of logistics. These, however, were not used as indicators for evaluating the festival's success.

Research Question 1: What indicators does GTC consider useful for measuring event impact?

The following goals for the event were identified from our discussion with Mr. van Deurs using the list of questions listed in the discussion protocol in section "Design of Informal discussion protocol with Frederik van Deurs from Green Tech Challenge to develop event criteria."

1. Have 6+ participating companies presenting at the festival
2. Have 200+ guests attending the festival throughout the duration of the event
3. Have 10+ media clippings covering the festival before, during or after the event
4. Have at least one representative from a C20 company attending the festival
   Note: OMX Copenhagen 20 or C20 makes reference to the 20 most-traded stock classes in the Copenhagen Stock Exchange.
5. Have a short promotional video of a maximum of 60 seconds for each participating company
6. Have at least two short videos of the festival and the activities carried out during the event
7. Obtain a Net Promoter Score[2] (NPS) of +25 for the festival

We considered goals 1 through 6 to be event logistics and therefore did not incorporate them into the criteria for measuring event success. Goal number 7 was considered a useful way of measuring event satisfaction and therefore, we incorporated it into the assessment tool as an additional indicator for criterion number three: "Attendees' Satisfaction with the Event".

Research Question 2: What are Mr. van Deurs' expected outcomes from the festival with respect to the attendees' knowledge of and interest in IoT and its applications?

Additional indicators for event assessment were suggested by Mr. van Deurs as a result of the informal discussion guided by research question number two. Specific questions were asked during this part of the discussion and his answers to these were used to develop additional festival indicators which were summarized as shown:

[2] A Net Promoter Score, otherwise known as NPS, is usually used by businesses to measure customer loyalty but was modified to be used for the festival purposes due to the fact that this score is calculated based on the question "How likely is it you would recommend [this festival] to a friend or colleague?" (Brain & Company, 2017) on a scale of 1-10 on a data tool such as a survey. For a NPS, scores of 9 and 10 are valued as "promoter scores", 7 and 8 are "neutral scores" and any score below 6 is valued as a "detractor score." To calculate NPS, the percentage of customers (or festival attendees) who indicate a score that classifies them as detractors is subtracted from the percentage of those who are classified as promoters. The difference is identified as the NPS.

a. Participants should show a positive increase in knowledge regarding the IoT concept as a result of having attended the festival.
b. Participants should learn about new IoT technologies or products they had not been exposed to before.
c. Participants should recognize the main IoT characteristics (namely, “smart” and “energy efficient”).
d. Participants should be able to distinguish between IoT consumer and industrial applications.
e. Participants should show an increased interest in IoT either in the form of
    i. Desire to attend more IoT events and continue learning about the subject.
    ii. Intention to implement IoT solutions within their career paths or to work in developing IoT solutions.

Final Set of Criteria for Event Assessment

In order to obtain the final criteria and indicators to assess whether the festival was successful in raising awareness of IoT, we merged the two sets of indicators developed by our team and by GTC’s co-founder, Frederik van Deurs, so that both our goals and GTC’s could be reflected on the festival.

Mr. van Deurs identified a number of specific logistical criteria he would like for the event to meet (numbered 1-6 in section “Research Question 1...” above), and we adopted those recommendations exactly as he made them. Indicator number seven was adopted under the criterion of event satisfaction as an additional indicator that set a target Net Promoter Score of +25. GTC’s remaining indicators labeled “a” through “e” were analyzed to conclude that most of them already correlated with an indicator set by our team in the initial criteria developed. The only indicator suggested by Mr. Van Deurs that was not adopted in the final evaluation tool was indicator d, “Participants should be able to distinguish between IoT consumer and industrial applications.” This was not included since it did not directly relate to our goal of raising awareness of IoT’s green applications and we reasoned that most participating companies would not be making evident the division between these two IoT fields. Therefore, it did not make sense to include a question regarding this indicator since participants would not be getting this information directly from the festival activities.

Furthermore, additional indicators that originated from the discussion with Mr. van Deurs were modified and added to our initial set of indicators for knowledge of IoT and interest in IoT. The first addition was Mr. van Deurs’ indicator “c” in relation to IoT characteristics, “Participants should recognize the main IoT characteristics (namely, “smart” and “energy efficient”).” As a result

of suggestion “c”, we developed indicator “I” detailed below that expects participants to be able to mention IoT green applications and forms part of the criterion of IoT knowledge. The second addition was Mr. van Deurs’ indicator “e” with respect to criterion “IoT interest”. We added indicator “V” that expects participants to be able to express whether they would be interested in implementing an IoT component into their career paths or work in the IoT field. After adding three additional indicators to our final criteria, we arrived at our final criteria detailed in the next section.

Final Criteria, Indicators, and Success Definitions for Event Assessment

Criterion 1. Attendees' knowledge of IoT post-event

The table below identifies the knowledge indicators of success for criterion 1 as well as the operational definitions of success (ODS) for each indicator:

Table 1

FINAL CRITERIA, INDICATORS AND SUCCESS DEFINITIONS FOR EVENT ASSESSMENT

	Criterion 1. ATTENDEES' KNOWLEDGE OF IoT POST-EVENT *To identify positive changes in knowledge of IoT and its green applications as a result of participation in the event, we identified that participants should*	1
Indicator I	Identify at least three green applications of IoT that participants learned about during the festival. These could be within the fields of energy savings, water consumption control, flood damage prevention, traffic reduction, home automation, or waste management.	
SUCCESS: over 50% of the attendees are able to identify three or more green applications of IoT when presented with a list containing applications that were represented through the participating companies' products at the festival.		
Indicator II	Give a complete definition of IoT or at least mention additional core concepts when defining the term after having attended the festival* **Note the "core concepts" are explained in detail in section "Scoring rubric for evaluating pre-event interview responses"*	
SUCCESS: over 50% of the attendees move up one classification in terms of their definition for IoT.		
Indicator III	Give new examples of IoT devices with green applications after attending the festival where participating companies showcased their products.	
SUCCESS: over 50% of the attendees should be able to mention at least one additional product than they could before the event.		
Indicator IV	Perceive a positive increase in their knowledge of IoT as a result of having attended the festival.	
SUCCESS: over 50% of the attendees should indicate that their perceived level of IoT knowledge increased by one point on a scale of 1-5 on a data tool, later developed in Objective 3.		

The operational definition of success (ODS) for criterion one was having at least three indicators met. Some indicators looked for changes in knowledge of IoT and its green applications while others measured only post-event knowledge acquisition.

In terms of our rationale, for Indicator I., we estimated the number of IoT green applications the public may be aware of before the event, and arbitrarily determined a reasonable number of green applications attendees should be able to identify after the event. We assumed that most students, which were our primary audience, may already have some knowledge of IoT applications prior to attending the event, however, that they would likely not have a strong grasp of the green applications or specific products that were presented at the event. We also took into consideration the number of green applications that would be showcased at the event, which equaled the number of participating green startups, and estimated that participants on average might visit half of the companies and one keynote presentation at the festival. Therefore, we settled on a number of applications that participants should be able to recall that was in part arbitrary and in part based on the number of green applications that participants would be exposed to at the event and used that for developing indicators in terms of increased knowledge of IoT for specific green applications.

For Indicator II., the initial indicator b. was rephrased and what constituted each knowledge classification was later specified with core concepts detailed in the section *"Scoring rubric for evaluating pre-event interview responses."*

Criterion 2. Attendees' interest in IoT post-event

The table below identifies the interest indicators of success for criterion 2 as well as the operational definitions of success (ODS) for each indicator:

Table 2

	Criterion 2. ATTENDEES' INTEREST IN IoT POST-EVENT *To identify positive impacts on general interest in IoT as a result of participation in the event, we identified that participants should*	2
Indicator V	Indicate they would be interested in implementing IoT solutions within their career paths or in working in developing IoT solutions.	
SUCCESS: over 50% of the attendees should either strongly agree or somewhat agree with planning to implement IoT technologies within their work areas or to develop IoT solutions.		
Indicator VI	Express desire to attend similar events to continue learning about IoT.	
SUCCESS: over 50% of the participants should be either extremely or somewhat likely to attend this or similar events in the future.		
Indicator VII	Express intention of acquiring more information on IoT and its green applications.	
SUCCESS: over 50% of the attendees should either strongly or somewhat agree with wanting to learn more about IoT and its green applications.		

The operational definition of success (ODS) for criterion two was having at least two indicators met. Each individual indicator within this criterion was concluded to be a form of IoT interest that participants could show after attending the festival and were therefore chosen to assess post-event interest.

Criterion 3. Attendees' satisfaction of the event

The table below identifies the satisfaction indicators of success for criterion 3 as well as the operational definitions of success (ODS) for each indicator:

Table 3

	Criterion 3. ATTENDEES' SATISFACTION OF THE EVENT *To identify high event satisfaction from the participants after having attended the festival, we identified that participants should*	3
Indicator VIII	Indicate with a 9 or 10 (on a scale of 1-10) they would recommend this event to friends/colleagues so that the event earns a Net Promoter Score (NPS) of 25.	
SUCCESS: The festival should obtain a Net Promoter Score of 25 points on a scale of -100 to 100.		
Indicator IX	Want to attend this event in the future.	
SUCCESS: over 50% of the attendees should be either extremely or somewhat likely to attend this event in the future		
Indicator X	Be satisfied with the methods that companies used to present information about their products and IoT.	
SUCCESS: over 50% of the attendees should either strongly or somewhat agree with the methods companies used to present information.		
Indicator XI	Agree the festival was an effective method to learn about IoT and its green applications.	
SUCCESS: over 50% of the attendees should either strongly or somewhat agree that the festival was an effective method to learn about IoT and its green applications.		

The operational definition of success (ODS) for criterion three was having at least three indicators met.

Objective 2 · Collaborate With Green Startups to Develop Effective Presentation Formats for Festival

Semi-Structured Interviews with Participating Green Companies

In order to acquire data that would allow us to design the activities that would take place at the festival, we conducted semi-structured interviews with the companies that agreed to participate in the event, which are a subset of the larger group of companies we contacted as part of the planning process described in Appendix B: Identifying startups.

The semi-structured interview is characterized by its flexibility in the use of questions and resources to be able to personalize the method to the participant's requirements so that a wider and deeper understanding of the topic of research is achieved (Galletta, 2013). Moreover, this method incorporates different types of questions in order to generate data based both on the participant's own experience and on the particular theory behind the discipline of research. In order to gauge the startups' experience in presenting and discuss methods they have and should use to present IoT at the festival, semi-structured interviews were carried out as a diagnosis and guidance tool.

Having a semi-structured interview allowed for some flexibility to clarify some questions that arose during interviews and start discussions regarding the format the companies should use to present at the festival. The flexibility offered by the nature of semi-structured interviews allowed for further exploration of presentation experiences and expectations on both our and the startups' side. To reduce inconsistency among interviews, all five members of our team were present at each interview to clarify or restate questions if the team member administering the questions was unclear in his or her phrasing.

These interviews served to collect information regarding how participating companies' products use IoT and at the same time how the products help alleviate one or more issues that negatively affect the environment. The final purpose of this instrument was to learn how these companies had presented in similar events in the past and for our team to make recommendations on how we would like them to present information in an interactive and informative way to effectively accomplish our goal of raising awareness of IoT and its green applications among attendees. Furthermore, these interviews also had logistical purposes, namely, determining the

amount of space and materials companies would need to set up and effectively present in an interactive and engaging way. Therefore, the interview guide developed for this semi-structured interview included questions that would help us obtain and organize this necessary information for each company.

This method was chosen since it would be conducted during the early stages of the development of the festival and would therefore allow for a better observation and diagnosis of issues that needed to be addressed. In this case, possible issues were the approaches the participating companies have to educate the public about IoT green applications. We assured, through this method, that participating companies would modify their presentation formats in accordance with our requirements of using multimedia tools, bringing physical products and demos that would be of interest to the attendees and providing informational giveaways to further extend the learning impact of the festival. We thought that multimedia tools, physical products and demonstrations of the products would keep audience members engaged and interested in what the companies had to say. We chose these characteristics based on our own personal experiences in attending events and agreed that these tools were more appealing. We asked the startups to bring informational giveaways so that attendees could continue to learn about the companies and conduct their own research on IoT.

These interviews were conducted by first arranging a meeting time and date with the companies that had previously agreed on participating in the Internet of Green Things event. For each interview, our group travelled to the company's office (with the exception of one company located in Sweden) and conducted the interview with the initial contact person and, depending on the specific company, other representatives joined the interview as well. During the interview, the designed protocol, described below, was used. The conversation was recorded through iPhone's Voice Memos application, with the verbal consent of the interviewees, and one member acted as a note taker. Finally, in order to make the interview results available to the companies, we sent follow-up emails with the specific conclusions we arrived at during the interview regarding the logistics (e.g. space need, materials they would bring, the specific interactive way they would use to present) and our goals and requirements for the festival as shown in Objective 2 results.

Design of Semi-Structured Interview with Participating Green Companies

Interview Preamble: Hello, my name is [every member introduces him or herself] and we are the IoT Team. As we stated in our e-mail invitation, we are a team of university students from Massachusetts in the United States working with Green Tech Challenge on a project. Our project

is to host a festival to raise awareness of the Internet of Things and its applications, especially those that help with energy savings and other environmental benefits, and evaluating the effectiveness of the festival. Before we begin with the interview questions, we would like to ask if you agree with us recording the interview. In addition, can we use your name in our final report if we choose to include this specific interview?

The numbered questions are research questions and the corresponding interview questions are marked with a "Q" at the beginning. These questions were directed to the company representative(s) that agreed to participate in the festival.

1. What would interest a startup/company to participate in a festival of this nature? What could a startup/company gain/accomplish?

   Q: What interests you and your company in participating in this event?

   How we thought this information would help accomplish the objective:

   In asking the companies what interested them to participate in the festival, we wanted to ensure that we had a clear understanding of each company's objectives in participating in the event. If their intentions did not align with the goals we laid out for the festival of raising awareness of IoT, a follow-up discussion was lead to explain to the interviewee(s) what the festival's purpose was, in order to make their presentations effective in reaching our goals. For example, if a company ended up being interested more in advertising their product/company without including educational information, our group wanted to be able to guide them in the direction of presenting more educational information.

2. What methods work best for a startup/company to present information about their products and solutions in order to effectively raise awareness of IoT solutions?

   Q: Have you presented at a festival, expo or similar event before? If so, what techniques have you used for introducing your company and products? How do you plan to present information on IoT and your products for this event in an interactive way?

   How we thought this information would help accomplish the objective:
   Asking this question was crucial so that our team could inform the participating companies what presentation methods we believed would be effective in engaging with the public to not only increase their knowledge of IoT solutions but also to raise interest about these technologies in an entertaining way and thus help achieve high event satisfaction. Through this question and the discussion that followed, we directed companies towards interactive presentation methods. We required that they used multimedia material and brought their physical products and other visual materials that would help to better convey their mission

and business. In the case that the companies had demos available that integrated their physical products with an app, we requested them to bring a method to interactively displaying how the product as a whole would function and allow participants to interact with the different features of the technology.

Q: Do you have any multimedia promotional tools for pre-event advertising?

How we thought this information would help accomplish the objective:
The intent of this question was to obtain multimedia tools from the companies whether it be videos or pictures and animations of their products and/or business. By obtaining promotional tools from the participating companies, we planned on publishing videos about each company on social media to increase the companies' visibility among attendees so that greater interest for learning about the companies could be initiated before the event.

Q: Do you have the information regarding your product and company in both Danish and English?

How we thought this information would help accomplish the objective:
This information was necessary to ensure that companies would be able to inform about IoT and its applications in English given that a percentage of attendees would not understand Danish.

Q: Do you plan on having any kind of takeaway or visual materials the attendees could take from your booth in order to increase the IoT education impact?

How we thought this information would help accomplish the objective:
This question allowed us to discuss with the companies the need for informational takeaway materials and to request that they prepare some materials if none were currently available. These materials were encouraged by our team so that the companies could provide additional IoT education after the festival.

3. What logistics does a startup/company consider in attending an event?

Q: How many representatives from your company do you plan on having attend the event?

Q: What space do you need for setting up your demonstrations?

Q: Is there any specific equipment or resources that will be needed for your space? E.g. power, Internet connectivity, etc.?

Q: Will the company representatives be available to present information on IoT and your product for the whole duration of the festival?

How we thought this information would help accomplish the objective:

These questions had mainly logistical purposes. We needed this information in order to plan accordingly what space and materials the companies would need in order to effectively present at the festival. In addition, to develop effective presentation methods, we needed the companies to be well prepared in terms of the number of representatives they would require to aid in their presentations.

Objective 2 Results

Our goal for these interviews was to achieve two main aims. First, we wanted to determine why companies were interested in attending the event. This was important information because if the company's interests did not align with our interest in raising awareness of IoT, we would have been able to communicate our goals clearly and request that they help meet our goal. Our second goal was to encourage the companies to utilize the most effective demonstration tools to maximize the festival's effectiveness in raising awareness of IoT.

Research question 1: What would interest a startup/company to participate in a festival of this nature? What could a startup/company gain/accomplish?

To ensure that we had a clear understanding of each company's objectives in participating in the event, we asked each of the startups why they were interested in attending our event. The table below illustrates each company's primary reasons for attending the festival.

Table 4

COMPANIES' INTEREST IN ATTENDING THE EVENT

COMPANY NAME	Anyware Solutions	Aqua Robur	Aqubiq	Nordsense	NorthQ	Urban Water
INTEREST IN PARTICIPATING IN THE EVENT	Exposure	Exposure		Exposure	Exposure	Exposure
	Media Coverage					
	Networking with students	Networking with students	Networking with students and companies	Networking with students	Networking with students	Networking with students
			Product Testing		Product testing	

These results indicated that, among the participating companies, the primary reason for attending the event was to network with students that were interested in IoT technology and to gain exposure for their company and their products. This information was valuable because it showed that the presenting startups highly prioritized teaching people about themselves, their product, and consequently the Internet of Things. Therefore, the ability for this event to raise awareness of IoT as well as to stimulate interest in the IoT field was in the best interest of all stakeholders.

Research question 2: What methods work best for a startup/company to present information about their products and solutions in order to effectively raise awareness of IoT solutions?

As alluded to in the background section, our team researched a variety of tools that, if utilized, result in a higher likelihood of participants understanding what they are being taught. These tools included informational flyers and interactive workshops. We wanted as many of these tools to be utilized as possible, so we created a list of teaching methods that we requested each startup to utilize. We required each participating startup to incorporate visuals, hands on materials,

interactive demos, and informative handouts into their presentations. The table below shows the results of these requests from each participating company.

Table 5

PRESENTATION AIDS UTILIZED BY COMPANIES

COMPANY / CATEGORY	Anyware Solutions	Aqua Robur	Aqubiq	Nordsense	NorthQ	Urban Water
Visuals	Roll Up (Vertical Info-banner)	Roll Up (Vertical Info-Banner) and Live Website	Roll Up (Vertical Info-banner) and pictures	Live website	Roll Up (Vertical Info-banner)	Roll Up (Vertical Info-banner)
Hands On & Interactive Demos	Adaptors and devices to play with	Demos with devices	Small stand with prototype, water tank, small sink, test stand with water running and app	Interactive demos with garbage can, iPad app and live website	Meters, controls, devices, hands on demos	Demos with device
Giveaways	One page flyer	No handouts	Flyers & business cards	No handouts	Flyers	No handouts

From these discussions we confirmed that each participating startup would be making their best effort to incorporate each of our recommended teaching methods into their presentations. We learned that all companies had experience presenting themselves and their products in an interactive, booth type setting. However, for most companies, the festival would be their first time presenting with an educational purpose, rather than a commercial or advertising purpose. Therefore, an important result of these interviews was to communicate to the participating companies what their presentation formats should be, and what type of information they should focus on in order to deliver the goal of raising awareness of IoT. As a result, all companies were prepared to utilize visual materials, as well as hands-on and interactive demonstrations to teach the public about their products.

In order to increase the impact of these interviews, our team decided to produce a follow-up email to reemphasize the information discussed in a written form. By sending this information in an email, companies could confirm the conclusions reached during our discussions, and the email would serve as a guide for our team's preferred presentation methods containing all of the important details discussed during the interview. A sample of the follow-up email sent to each

participating company is shown below. It is important to note that information in this email depended on the company and the presentation formats we discussed with them during the interview.

Sample follow-up email to participating companies restating suggested presentation format

Hi Manuel [or insert company contact name],

First we would like to thank you for taking the time to meet with us and answer all of our question to make sure this will be a successful event, we really appreciate your help!

This is just a follow-up email of some of the conclusions we reached in our earlier discussions for your records in case you need any of this information in the future, but if you need anything else or have any other questions, do not hesitate to contact us!

1. *This, from your point of view, will be a great opportunity for recruiting promising engineering students. It may also be an opportunity to get in contact with professionals currently working within the IoT industry in Denmark.*
2. *Presentation and booth: we agreed you will have a space at the Skylab venue of approximately two tables, which can be in any configuration (see pictures attached). Additional materials to bring, as discussed, will be a trash bin to better represent what your product does. You will be also bringing all of the hardware (physical devices and sensors you showed us) and a laptop(s)/iPad to show your product demo so that the activity is more interactive and interesting. Any other materials you consider useful for your presentation and booth, feel free to bring them and if you need they will take a significant amount of space let us know so we can be prepared!*
3. *Takeaways: regarding takeaways as material for encouraging further interest in IoT and expanding the educational experience, you mentioned at the moment you have none. That is completely fine! If you, however, decide you could prepare something to achieve the aforementioned goals feel free to bring those and let us know, so we can add that for the record of our academic paper.*
4. *Promotional Tools: we are trying to draft out an intensive advertising campaign and for that we would like to advertise the companies that will be attending. Could you please send us the product briefing you talked about so we can animate it just to make it more interactive? We will of course send it back to you and wait for your approval before using it for advertising.*
5. *Festival goals: finally, we would just like to remind you that our goal for this festival is to raise the level of education and interest attendees have regarding IoT and especially, the potential IoT has to help reduce environmental issues. We will be assessing if this goal was met after the festival. Thus, we strongly encourage you that when you engage with attendees, you inform them of the IoT component of your product (how your product uses IoT) and how your product helps the environment (e.g. reducing emissions from reducing the amount of trucks on the streets, better management of waste…)*

Best regards,
Maria Sierra [or insert IoT group member name]

Objective 3 - Perform a Pilot Test of the Festival to Determine the Effectiveness of Data Collection Tools

In order to ensure that the festival would raise awareness of IoT effectively and provide data that could be used to test for that effect, we performed a pilot festival with the primary aim of testing our assessment protocol. To do this, we used a two-step approach.

The first step was developing data tools that could be used to analyze the effectiveness of the pilot festival in raising awareness of IoT. To do this, we created three different data tools, which were a pre-event interview, a post-event survey, and a post-event discussion about those two tools. This approach enabled our team to test our pre- and post-event tools to determine the utility of these tools for yielding useful data. We completed this step to gauge the usefulness of these tools to determine if they should be used for the actual festival and, if deemed useful, to identify components of the tools that would benefit from revisions before being used in the festival.

To make improvements on the data collection tools, we facilitated a discussion with participants of the survey and interviews after the pilot event. This discussion was aimed at discovering what questions were confusing to the attendees and gaining insight on what improvements could be made. To do this, we asked everyone who attended the pilot festival to stay after the event was over to discuss the questions. One team member took notes as participants gave recommendations and provided their feedback. We expected this information to be useful in deciding if the data collection tools needed any modification so that its content could be clear to the participants of the post-event survey and pre-event interview at the actual festival.

The second step in accomplishing this objective was actually performing a pilot festival. In order to complete this objective, we simulated the activities within the festival as closely as possible. The pilot event was hosted in our apartment residence at Hotel 9 Små Hjem and participants included fellow Worcester Polytechnic Institute students. We began by posting flyers on the doors of all the apartments informing people of the event and encouraging them to register. The day before the event we sent Facebook reminders to all who registered to remind them of the event.

At the pilot event, first we had every person who entered either check in or register in the case that they had not pre-registered. We conducted our pre-event interviews, choosing every third person, as described in the section below. Once the interviews were completed, the pilot

festival officially began. Each member of our team represented one of the five companies we had confirmed as participants at the time. We were each responsible for presenting information about the company and their IoT product(s) in our own way while trying to simulate how we would expect the company to present on the day of the actual festival. This allowed for our presentations to be diverse which would better represent the differences in presentation formats that the startups would use at the actual festival. We spent an hour representing the companies to give attendees enough time to cycle through some or all of the booths. After the presentation portion of the pilot festival was completed, we conducted the surveys (described later in this section) by having participants fill out the survey on their phones or computers.

Pilot Pre-Event Semi-Structured Interviews

Semi-structured interviews are a beneficial method of interviewing because they allow for flexibility in the use of questions. In order to assess the baseline level of IoT awareness in the form of either knowledge of or interest in IoT before the event, semi-structured interviews were conducted. As observed in objective two, the flexibility offered by the semi-structured interviews allowed for further exploration of IoT-related areas that came up spontaneously during interviews. Limiting factors of the pre-event interview approach are consistency across interviewers and the difficulty in ensuring that the individuals interviewed before the event complete the post-event survey (discussed in the “Post-event survey with attendees” section) which would allow our team to analyze changes in knowledge and interest through responses before and after the event.

In order to overcome the aforementioned challenges, it was necessary to have a fully trained group of interviewers that could assure a high level of consistency across interviews and engage with the participants to persuade them to return for the exit survey. The training protocol consisted of our group rehearsing together how each one of us would conduct the interview with the opportunity of the others commenting on what they would usually say to clarify questions and giving suggestions to the person playing the role of the interviewer. We also went over the interview protocol several times until the group agreed on a very similar way of carrying out interviews and surveys. It is also important to note that developing the protocol or set of questions guiding the interviews is a very important and exhaustive process that requires adequate field-testing and logical connection of each question to the research’s purpose, so that a full in-depth exploration of the subject under study is achieved (Galletta, 2013). Our purpose in using this method was to obtain detailed information from each interviewed attendee about both their personal experience with and knowledge of IoT technologies before the event.

Our approach for developing the pre-event interview protocol was to draft questions that an average university student (our primary audience) would understand but to which they would not

have a fully structured answer, including specific examples. Our questions were drafted from our own experiences with university students attending technical schools in the United States, and we assumed that their level of knowledge closely resembled the knowledge of university students attending technical schools in Denmark. There was a certain margin of error that originated from this assumption since we did not have any data on the average Danish students' level of IoT knowledge.

Design of pre-event semi-structured interview with pilot festival attendees

Interview Preamble: *Hello, my name is [names] and we are a group of students from the US working here on a project of hosting this festival to raise awareness of the Internet of Things and assess how effective the event was. Part of our project is to conduct these pre-event interviews just to get a sense of the participant's knowledge of IoT before the event. We would now like to ask if you agree with us interviewing you for academic purposes and recording the conversation. In addition, can we use your name in our final report if we choose to include this specific interview?*:

i. What is your name? (Last, First)
ii. What is your e-mail address?

I.1. How would you describe the Internet of Things?
I.2. List some of the IoT devices that you know of.
I.3. What do you think IoT is usually used for?
I.4. Can you think of any current or potential IoT applications that help the environment (if they ask for an example, examples include: improving energy efficiency, reducing resource consumption, improving waste reduction)?
I.5. What interests you about the Internet of Things?
I.6. Why did you decide to attend the event today?

Design of scoring rubrics for pilot pre-event interview responses

In order to convert the qualitative responses from the pre-event interviews into quantitative results, we created a scoring rubric. This rubric applied a scoring system to each question within the interview. Questions one through four assessed the interviewees' knowledge of IoT and its green applications. For these questions, we wanted to classify participants into groups in order to gain a baseline understanding of the level of knowledge attendees had of IoT and its green applications before coming to the festival. This would allow us to compare the knowledge gained once the participant took the post-event survey, described later in this section.

To develop a scoring rubric for question one, we identified the keywords we consistently found during our research about IoT consisting of connectivity or networking, sensors or hardware, software, data collection, and analysis. Answers from the participants were then classified as barely to non-knowledgeable, moderately knowledgeable, and highly knowledgeable as described in the rubric shown in the table below. For question two, we arbitrarily selected the number of IoT products that represented different levels of knowledge of IoT. We thought that five devices would be sufficient to show that a person is knowledgeable of IoT, especially since we do not expect a high level of pre-event knowledge among most attendees. For question three, moderate knowledge of IoT would be demonstrated by listing any application of IoT regardless of environmental benefit. Question four was made only to be asked to participants who named a general application of IoT in question three. We did this because we recognized that a person may not identify the environmental applications of IoT unless they were prompted to specifically do so.

Questions five and six consisted of categories that would be used to gain some insight on initial levels of interest in IoT among the attendees. Question five categorizes industrial, consumer, and environmental applications of IoT along with an option for a different specific IoT interest response. With these established, we were able to identify what area of IoT was most interesting to attendees. For question six, we wanted understand the reasons attendees decided to come to the festival. This served the following purposes. First, this information enabled us make recommendations for future events on what is most appealing to the general public. Second, this information helped in detecting a change in the level of interest in IoT post-event. If a person were to attend the festival for the purpose of networking and in the post-event survey (described later in this section), they indicated that they were interested in attending more IoT events, we could infer that their interest in IoT was raised or expanded.

Table 6

PILOT SCORING RUBRIC FOR PRE-EVENT INTERVIEW

How would you describe the Internet of Things?	**I.1**
3 - Highly Knowledgeable	Includes connectivity or networking, sensors or hardware, software to merge the previous two in their definition, and data collection and analysis
2 - Moderately Knowledgeable	Includes at least 2 of the concepts mentioned above
1 - Barely to non-knowledgeable	Includes only one concept of network, hardware, software, data or is not able to define any of the concepts as part of IoT
I.2	**List some of the IoT devices that you know**
3 - Highly Knowledgeable	Lists more than five devices of IoT.
2 - Moderately Knowledgeable	Lists more than two and fewer than five IoT devices.
1 - Barely to non-knowledgeable	Is not able to list any device.
What do you think IoT is usually used for?	**I.3**
3 - Knows specific green applications	Includes energy savings, automation, and other environmental benefits in their answer.
2 - Knows general applications	Includes at least 2 of the concepts mentioned above.
1 - Does not know any applications	Is not able to list any device or application.

1.4	Can you think of any current or potential IoT applications that help the environment (if they ask for an example, examples include: improving energy efficiency, reducing resource consumption, improving waste reduction)? If yes, how can IoT be used to solve issues that negatively affect the environment? Can you give specific examples?
3 - Knows specific green applications	Specific example including one of the following: improving energy efficiency, reducing resource consumption, improving waste reduction and give at least one specific product that serves as an example.
2 - Knows general applications	Specific example including one of the following: improving energy efficiency, reducing resource consumption, improving waste reduction and is NOT able to explain its application to solve issue.
1 - Does not know any applications	Is not able to think of any current or potential application to help the environment.

1.5	What interests you about IoT?	Why did you decide to attend the event today?	1.6
	Industrial applications	Network	
	Consumer products	Learning	
	Environmental applications	Interest in the environment	

Pilot Post-Event Survey

In order to obtain data from a larger sample of the attendees regarding the level of IoT awareness as a result of attending the festival, online surveys were administered through laptops on-site to participants who were willing to participate in person, and were sent out after the event to all participants that provided an email address during registration and did not fill the survey in person.

A survey can be defined as a research method systematically administered to a selected sample of a population to obtain quantitative data on the issue of study (De Leeuw et al, 2008). Surveys allow data collection for a larger sample at a lower cost and time commitment when compared to interviews. Therefore, this method provided a larger representative picture of the

population's characteristics (Blackstone, 2012), in this case, the post-event IoT knowledge of the pilot festival attendees. Another key feature of surveys is the consistency during implementation given that these are standardized (no variation in the questions asked). This was beneficial in the sense that it counteracted the qualitative interviews' margin of inconsistency and provided more concrete data that we observed to enable our team to hypothesize some expected outcomes for the survey that would be administered at the actual festival.

While surveys attempt to achieve validity through the consistency of the fixed questions, this same validity may be affected if questions are not structured well enough to minimize the extent of misinterpretation. This limitation was counteracted through a discussion following the pilot festival in which participants of the survey were asked what improvements could be made in terms of the wording of questions to enhance clarity (discussed in the "Post-event discussion on data tools with attendees" section). The survey questions developed for the pilot event are detailed below.

We utilized the software program Qualtrics to administer the survey and analyze the results. From the survey, we expected attendees to quantify their knowledge of IoT before the event at a lower score than they quantify their knowledge of IoT after the event. We also expected attendees to develop a more in-depth understanding of how IoT can help the environment, exemplifying this increase in knowledge by stating new applications and products they learned from attending the festival.

Design of pilot post-event survey with festival attendees

1. What is your name?

S.1. How would you describe the Internet of Things?
S.2. Rate your knowledge of IoT before the event (1-5)
S.3. Rate your knowledge of IoT after the event (1-5)
S.4. Did this event help you understand how IoT can be energy efficient and contribute to solving environmental issues? Would have you preferred to be informed in a different way and if so, explain?
S.5. After attending the event, list any new applications or examples of products you now recognize that demonstrate IoT's potential to solve environmental issues?
S.6. Did you enjoy the way participating companies presented information on IoT and their products? If not, what methods do you think would be more relevant? (Yes/no & free answer)
S.7. Would you be interested in working in the IoT field?
S.8. Did participating in the event make you more interested in learning more about IoT?
S.9. Which company's booth did you find most interesting and why?

S.10. Which one or two activities were the most impactful for learning about green applications of IoT, and why was that activity impactful for you? (E.g. product demonstration for company **X,** video demonstration of company **X**)

S.11. How likely are you to recommend this event to someone else? (1 not at all likely - 10 extremely likely)

S.12. What aspects could we improve on for future festivals?

S.13. Would you attend this event in the future?

Objective 3 Results

In this section, we present results of the pilot festival that are relevant to assessing and reviewing the pre-event interview, pre-event interview rubrics, and post-event survey. Since the pilot festival was intended to assess our interviews and surveys, most of the results are not presented except where it is relevant to understand the revisions that were made.

Pilot Pre-Event Semi-Structured Interview Results and Changes

The table below describes changes that we made to the interview questions from data that we analyzed and feedback that we received during the discussions with attendees.

Table 7

CHANGES TO PRE-EVENT INTERVIEW QUESTIONS AFTER PILOT FESTIVAL

	QUESTION BEFORE	QUESTION AFTER	REASON FOR CHANGE
I.1	How would you describe the Internet of Things?	Remained the same	Does not apply
I.2	List some of the IoT devices that you know	Removed	This question added extra length to the interview, and we did not get any useful information out of this question from the pilot festival.
I.3	What do you think IoT is usually used for?	Removed	This question added extra length to the interview, and we did not get relevant results out of this question from the pilot festival. This also tended to provide similar answers to the next question, and adding a question to analyze a change in response with the post-event survey would make it take significantly longer.
I.4	Can you think of any current or potential IoT applications that help the environment? If yes, how can IoT be used to solve issues that negatively affect the environment?	Can you think of any IoT applications or specific products that help the environment and how?	The new question directly addressed criterion 1 indicator 1, and made it easier to score with a rubric.
I.5	What interests you about the Internet of Things?	Removed	We found that answers to this question in the pilot festival were redundant with the next question.
I.6	Why did you decide to attend the event today?	Remained the same	Does not apply

The pilot festival also allowed us to test how the systematic sampling would work for pre-event interviews, and most things went smoothly. The recordings of the interviews on smartphones were sufficient to transcribe the interviews after the event, although we found that we should move

to a separate room while recording to get the best results. Scoring the interview questions as the interview was being conducted went smoothly as a result of our training protocol. Handwritten notes from a second interviewer helped with transcriptions, and also allowed us to more easily decide which parts of the interview to transcribe.

Final design of pre-event semi-structured interview with festival attendees

The numbered questions are research questions and within each numbered question are the corresponding interview questions marked with the letter “i”, and the indicator(s) they address within the set of criteria for event assessment. Questions i. and ii. were to be filled out by the interviewee in order to match pre-event interview responses and post-event survey responses.

i. What is your name? (Last, First)

ii. What is your e-mail address?

1. How aware are participants about IoT before attending the event? (I.e. Do participants know how to define IoT, know about IoT products and applications?)

   i.1. How would you describe the Internet of Things? [Addresses criterion 1 indicator IV]

   How the information would help to assess the effectiveness of the festival:
   This will help us understand if attendees have some knowledge of IoT, or if they are completely unaware of it before the event. This information will be used to assess the knowledge they have acquired at the end of the event when compared to the post survey question.

2. Can participants define or provide examples of how IoT benefits the environment in any form (such as improving energy efficiency, reducing resource consumption, and improving waste reduction)?

   i.2. Can you think of any IoT application or specific product that helps the environment and how? [Addresses criterion 1 indicator I and indicator II]

   How the information would help to assess the effectiveness of the festival:
   This information will help assess how knowledgeable the attendees are about green applications of IoT before the event and how successful the festival was in increasing the attendees’ understanding. The before and after responses from attendees will show whether there was a change in the level of knowledge and an increased interest regarding

IoT applications for environmental benefits which can help our team to qualitatively assess the effectiveness of the festival.

3. What were reasons participants attended the event?

   i.3. Why did you decide to attend the event today? [Addresses criterion 2 indicator VII]

   How the information would help to assess the effectiveness of the festival:
   This information will help us understand if the interest of the attendees in participating in the event changed in any way after the festival. This will be done by comparing this information with interest-related questions asked in the post-event survey. For example, if participants attend the event in search of network and then in the post survey they respond they are interested in learning more about IoT applications or implementing it to career profession, then the event increased their interest.

Pilot Pre-Event Interview Scoring Rubric Results and Changes

After analyzing the results obtained from the pilot pre-event interview, some necessary adjustments were made to ensure that relevant data could be collected to determine whether the event met the criteria set in Objective 1. In order to guarantee that the new data that would now be collected had a pertinent evaluation tool, some updates and changes were made to the pilot scoring rubric.

First, in terms of question number i.1, we agreed that a complete Internet of Things definition would include four core concepts. These components were hardware, software, data and action. For each of the concepts, we developed a list of keywords, shown in Figure 6, and looked for those words in each interviewee's definition. If at least one of the keywords from a set was mentioned by the interviewee, it could be assumed that the corresponding core concept was covered in their definition. Furthermore, we changed the classification of responses to four different categories, namely, barely to non-knowledgeable, moderately knowledgeable, highly knowledgeable and completely knowledgeable, and the responses were graded according to the number of core concepts a participant was able to mention as detailed in the final rubric below.

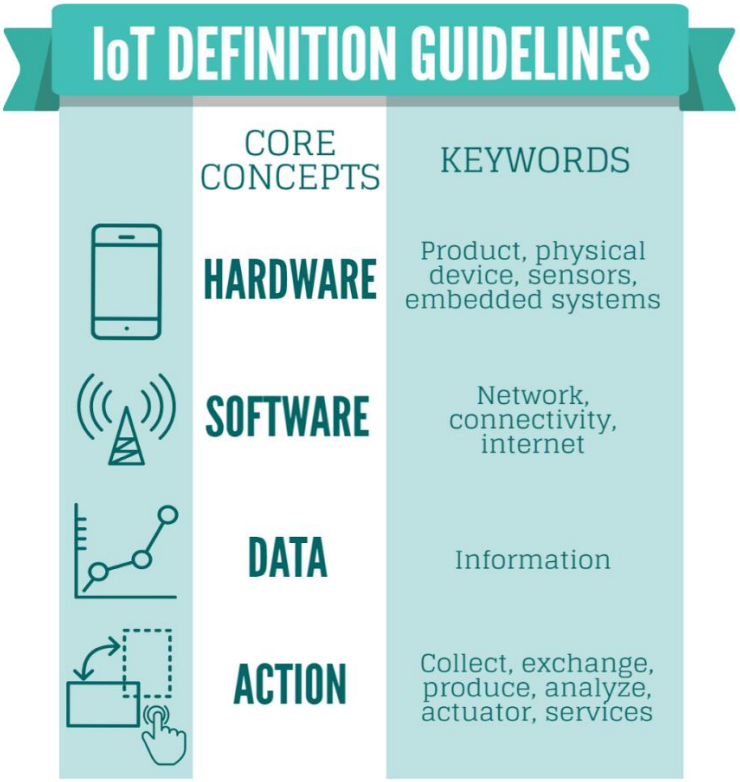


Figure 6: Core IoT Concepts and Associated Keywords

A formal definition of IoT, taken from the International Telecommunications Union, was also analyzed: "[IoT is] a global infrastructure for the information society, enabling **advanced services [action]** by interconnecting (**physical** and virtual) **things [hardware]** based on existing and evolving interoperable **information [data]** and **communication technologies [software]**" (ITU, 2016). Similarly, keywords or the four core concepts were identified and signaled in bold.

Pilot interview questions I.3 and I.4 were replaced by question i.2 in the final interview design. Therefore, the rubric sections for these questions were eliminated. For interview question i.2., we expected attendees to be moderately knowledgeable in terms of products or general applications they may know of. Therefore, we classified their responses into three IoT knowledge levels depending on the number of products and/or applications they could mention. The specific number of examples for each category was modified as a result of testing the previous interview questions and rubric during the pilot festival. We concluded it may be difficult for an interviewee to mention all the examples he or she may know when asked spontaneously during an interview. Therefore, we lowered this number, assuming it will be an indicator of what a person may remember during an interview and not of all of the actual devices/applications this person may know.

Finally, interview question number three responses were evaluated following a coding system. The reason(s) given by the interviewee for attending the event would fall into one of the

categories listed in the rubric and this would then be used to classify and gauge the initial interest of the participants in attending the event and was then contrasted with their IoT-related interest post-event, which was reflected in the interviewee's desire of attending more similar events, continuing to learn about IoT, and other forms.

Final design of scoring rubrics for pre-event interview assessment

The table below shows a rubric system for evaluation

Table 8

FINAL SCORING RUBRIC FOR PRE-EVENT INTERVIEW

How would you describe the Internet of Things?	i.1
4 - Completely Knowledgeable	Includes four core concepts or corresponding keywords: 1. Hardware: 2. Software: 3. Data: 4. Action:
3 - Highly Knowledgeable	Includes three core concepts or corresponding keywords: 1. Hardware: 2. Software: 3. Data: 4. Action:
2 - Moderately Knowledgeable	Includes two core concepts or corresponding keywords: 1. Hardware: 2. Software: 3. Data: 4. Action:
1 - Barely to non-knowledgeable	Includes one or no core concepts or corresponding keywords: 1. Hardware: 2. Software: 3. Data: 4. Action:
i.2	**List some of the IoT devices that you know**
3 - Highly Knowledgeable	Is able to list two or more IoT products with green applications and explain how these work and contribute positively to the environment.

2 - Moderately Knowledgeable	Is able to list one IoT product with green applications and explain how it works and contribute positively to the environment.
1 - Barely to non-knowledgeable	Is not able to list any device. Interviewee may have a general idea of applications that help the environment.

Why did you decide to attend the event today? *The following question follows a coding system for evaluation	i.3
Network	
Learning	
Interest in the environment	
Other	

Pilot Post-Event Survey Results and Changes

By designing a Qualtrics survey for the pilot festival, we were able to learn about the software, and how to use it effectively to collect and analyze results for our post-event survey. Administration of the survey went smoothly once we figured out how to send out a link to the survey, and respondents only had a few suggestions for how to improve the technical aspects of the survey.

After hosting the pilot festival, we looked at the survey results and responses to see if they matched our expectations, and if we were able to obtain useful information from the questions that we asked. We also used the pilot festival as a way to test the Qualtrics surveys and figure out how to effectively use the system before having to use it at the actual festival. One key piece of information that we gained from testing these surveys is how long it took attendees to complete the survey. The 12 people that completed the survey took an average of 7 minutes and 30 seconds to complete the entire survey. The survey was also completed in a minimum time of 4 minutes and 40 seconds, and a maximum time of 12 minutes and 17 seconds. Our initial goal was to have the survey take less than 10 minutes to complete, and since we succeeded in designing a survey to meet this goal, we did not change the length of the survey. The following table shows changes that were made to the survey questions.

CHANGES TO POST-EVENT SURVEY QUESTIONS AFTER PILOT FESTIVAL

QUESTION BEFORE		QUESTION AFTER	REASON FOR CHANGE
S.1	How would you describe the Internet of Things?	Remained the same	Does not apply
S.2 S.3	- Rate your knowledge of IoT before the event (1-5) - Rate your knowledge of IoT after the event (1-5)	Remained the same	Does not apply
S.4	Did this event help you understand how IoT can be energy efficient and contribute to solving environmental issues? Would have you preferred to be informed in a different way and if so, explain? (Yes/ no & free answer)	What general green applications of IoT did you learn about during the festival? (multiple choice)	Gave us better insight into what applications attendees learned about from the event.
S.5	After attending the event, list any new applications or examples of products you now recognize that demonstrate IoT's potential to solve environmental issues. (Free answer)	After attending the event, list any new examples of products you now recognize that demonstrate IoT's potential to solve environmental issues. (Free response)	Minor wording changes that helped attendees understand the question better.
S.6	Did you enjoy the way participating companies presented information on IoT and their products? If not, what methods do you think would be more relevant? (Yes/no & free answer)	Removed	Pilot festival attendees were confused by this question, and we didn't get useful results, so we swapped it for the two questions above.
S.7	Would you be interested in working in the IoT field? (Yes/No)	Are you more interested in implementing IoT in your field of work or in working to develop IoT solutions as a result of attending this festival? (5 point Likert scale)	Since not all attendees were studying technical subjects, this question was more relevant since it helped measure increased interest in IoT as a direct result of the festival.

S.8	Did participating in the event make you more interested in learning more about IoT? (Yes/No)	Are you more interested in learning more about IoT as a result of this festival? (5 point Likert scale)	Wording changes made the question less confusing, and the Likert scale gave us more relevant results than just a yes/no answer
	N/A	How many company booths did you attend? (number)	This question allowed us to get more insight about the event for future recommendations.
S.9	What company's booth did you find most interesting and why? (Multiple choice with free answer if company selected)	Which company's booth did you find most interesting? (multiple choice)	This question was broken into two questions with the one below since the results overlapped in the pilot festival results.
S.10	Which one or two activities were the most impactful for learning about green applications of IoT, and why was that activity impactful for you? (Free answer)	What activity at the booth was the most effective for learning about green applications of IoT? (Free answer)	Wording change made the question more understandable for attendees.
S.11	How likely are you to recommend this event to someone else? (1 not at all likely - 10 extremely likely)	Remained the same	Does not apply
S.12	What aspects could we improve on for future festivals?	Remained the same	Does not apply
S.13	Would you attend this event in the future? (yes, no)	How likely would you be to attend this event if it was offered in the future? (1-5 very likely)	Changing the wording of this question clarified what we were really asking for, and changing the scale gave us results that were a little more detailed and useful.
New	N/A	Do you believe this event helped you understand how IoT can be energy efficient and contribute to solving environmental issues? (5 point Likert scale)	Gave us more quantitative insight as to if attendees thought the event helped them understand more about green IoT.
New	N/A	Do you believe the festival was effective for learning about IoT and its green applications? (5 point Likert scale)	These two questions were swapped for question S.6 to gain better insight on if attendees thought the festival was an effective method, and if they had any ideas for more effective methods.
	N/A	Are there other methods for learning about IoT and its green applications that you think would be more effective? (free answer)	

Final design of post-event survey with festival attendees

The numbered questions are research questions and the corresponding survey questions begin with an “s”. Next to each question is the indicator(s) it addresses within the set of criteria for event assessment.

I. What is your name? *This information will only be used to match pre- and post-event responses*

1. Do participants better understand what IoT is after the event?
   s.1: How would you describe the Internet of Things?
   [Addresses criterion 1 indicator IV when combined with pre-interview responses]

   s.2: Rate your knowledge of IoT before and after the event (1-5)
   [Addresses criterion 1 indicator III]

   How the information would help to assess the effectiveness of the festival:
   These questions will help provide additional evidence that participants gained knowledge from the event by comparing the values for both answers. This directly correlates with two of our indicators for success.

2. Did participants gain a better understanding of green IoT applications?

   s.3: After attending the event, list any new examples of products you now recognize that demonstrate IoT’s potential to solve environmental issues?
   [Addresses criterion 1 indicator II]

   s.4: What general green applications of IoT did you learn about during the festival? (Checklist of energy savings, water consumption, water control, water savings, flood damage prevention, traffic reduction, home automation, waste management, and other where a new answer can be provided.)
   [Addresses criterion 1 indicator I]

   s.5: Rate the extent to which this event helped you understand how IoT can be energy efficient and contribute to solving environmental issues (1-5)
   [addresses criterion 3 indicator XI]

   s.6: Do you believe the festival was effective for learning about IoT and its green applications? If not, explain why, and provide suggestions for other methods? (Likert scale

5 point, with optional free response if they disagree)
[Addresses criterion 3 indicator XI]

How the information would help to assess the effectiveness of the festival:
This question will provide evidence of whether participants were able to not only learn more about IoT, but how IoT can be applied to areas of sustainability. This will provide evidence beyond the interviews and indicate if participants learned about green IoT applications.

3. Do participants have a stronger desire to work or contribute to developing more IoT green solutions after the event?

   s.7: Are you more interested in implementing IoT in your field of work or in working to develop IoT solutions as a result of attending this festival? (Likert scale 5 point)
   [Addresses criterion 2 indicator V]

   s.8: Are you more interested in learning more about IoT as a result of this festival? (Likert scale 5 point)
   [Addresses criterion 2 indicator VII]

   How the information would help to assess the effectiveness of the festival:
   This question aims to gauge the attendees' level of interest in getting involved with IoT and research and/or development of IoT solutions and whether their level of interest increased due to having attended this event. This information would address one of the criterion we have determined as a success indicator.

4. What strategy/strategies of presenting information is effective and engaging?

   s.9: How many company booths did you attend?

   s.10: Which company's booth did you find most interesting and what activity at the booth was the most effective for learning about green applications of IoT? (With none of the above as an option)
   [Addresses criterion 3 indicator X]

   How the information would help to assess the effectiveness of the festival:
   This information will provide our team with attendees' opinions on what presentation strategies were most appealing or allowed for the most amount of absorption of information. The first question will allow us to assess whether the attendee visited enough booths to have a valid response for number of products they observed in criterion 1

indicator II. The last question will provide a quantifiable evaluation of which strategy was most effective.

5. How likely are participants to attend a similar event or recommend this event to others?

   s.11: How likely are you to recommend this event to someone else? (1 not at all likely - 10 extremely likely)
   [Addresses criterion 3 indicator VIII]

   s.12: How likely would you be to attend this event if it was offered in the future? (1-5 1 not likely, 5 very likely)
   [Addresses criterion 3 indicator IX]

   How the information would help to assess the effectiveness of the festival:
   This information will inform us on whether participants are likely to spread the word on this event and will continue conversations regarding IoT green applications with friends and colleagues.

6. Do participants think the event was well organized? Do they believe the event was an effective format for IoT learning?

   s.13: What aspects could we improve on for future festivals?

   How the information would help to assess the effectiveness of the festival:
   This information provides feedback for how the event was perceived by participants in terms of organization and logistics, enables us to generate recommendations for the future, and determine whether the festival format was appropriate for conveying IoT information.

Objective 4 - Analyze the Effectiveness of the Festival in Terms of the Selected Criteria

For the purpose of assessing the effectiveness of the event on raising awareness of IoT among its attendees, we engaged in a mixed methods approach, utilizing the data tools developed during the pilot festival method of our project. The pre-event interview and the post-event survey provided us with different sets of data; the pre-event interview contained more detailed responses that were qualitative while the post-event survey provided data that was less-detailed in content, but more quantitative and gave numerical insight on the level of knowledge gained and the level of

satisfaction achieved. In addition to these two data tools, we also developed a semi-structured interview for startups that participated in the festival, to gain another perspective on the event's success.

Pre-Event Semi-Structured Interviews with Festival Attendees

As described in objective three, semi-structured interviews were a beneficial method of interviewing because they allowed for flexibility in use of questions. In order to assess the baseline level of IoT awareness in the form of either knowledge or interest before the event, semi-structured interviews were carried out as a diagnosis tool.

We attempted to avoid confusion due to the phrasing of the interview questions by using the updated interview questions that were developed as a result of the pilot-test festival method in Objective 3. We also determined that the updated questions would best provide our team with data that could be analyzed and provide useful information for determining whether the indicators that formed part of the criteria for the event assessment in Objective 1 were met.

To select participants, we decided to use convenience sampling, sampling as many people as possible who agreed to participate in the interviewing process. We decided to use this sampling approach as opposed to the systematic sampling approach we used in the pilot festival (see Objective 3) because we only received 60 pre-registrations, and were concerned that our festival attendance might not be high enough to allow systematic sampling.

For the interviewing process, we asked the participant for his or her consent to be recorded during the interview. To conduct the interviews, one person led the questioning portion and gave a score for each question according to the scoring rubric developed as a result of the pilot-festival in Objective 3, and one person recorded the interview via iPhone's Voice Memos application and conducted a second evaluation of the interview according to the same scoring rubric. We used the updated interview questions developed as a result of Objective 3. On average, the interviews took approximately 5 minutes to administer.

To enable our team to match responses from the pre-event interview with the post-event survey, during the interviewing process, we asked each interviewee to provide us with his or her name and email address. We emphasized during the interview that we would greatly appreciate each interviewee's participation in the post-event survey to enable our team to conduct our research. We also had a member of our team present at the exit at all times to ask attendees to

take the survey before exiting. The name and email provided during the interview enabled us to email the survey to interviewees in the case that they did not complete the survey at the event.

The purpose of the pre-event interview was to determine the baseline knowledge each participant of the interview had of IoT and its green applications. This knowledge would then be compared with the responses from a post-event survey administered at the exit of the festival. The method we used to compare the responses from the interview and the survey is described below in the section titled "*How to use the Interview and Survey Responses to Analyze Festival's Effectiveness in Raising IoT Awareness"*.

Post-Event Survey with Festival Attendees

In order to obtain post-event data from as large number as possible in terms of festival attendees, we administered surveys on-site via laptops that were located at the exit of the festival. One member of the team was located at the exit and responsible for instructing attendees to take the survey before they left. For attendees that did not complete the survey at the festival, we sent the survey to the e-mails they provided during the registration process.

The final surveys were administered using Qualtrics software and its design is presented as part of the results for the pilot festival in a previous section. From the survey, we expected attendees to quantify their knowledge of IoT before the event at a lower score than they quantified it after the event. We also expected attendees to develop a more in-depth understanding of how IoT can help the environment, exemplifying this increase in knowledge by stating new applications and products they learned from attending the festival. Each question in the survey was paired with the indicator it provided information for in the final survey questions developed as a result of the pilot festival.

Analysis of Interview and Survey Responses

In order to determine whether the festival achieved success in each of the three criteria set by our team to analyze the festival's effectiveness, we made use of the data collected from pre-event interviews and post-event surveys.

For criterion number one, *"Attendees' knowledge of IoT post-event"*, we made use of the questions from the interview that matched with the questions from the survey to determine change in knowledge regarding the definition of IoT and its green applications. Interview question i.1 and survey question s.1 was *"Describe the Internet of Things"*. This question was used to measure change in how well participants could define IoT. This was evaluated using the scoring rubric guidelines for defining IoT, developed as a result of the pilot festival in Objective 3. According to

the rubric, a complete definition of IoT involved four core concepts and, depending on how many core concepts or keywords the participants were able to mention, participants would fall into one of four knowledge-level categories, namely, barely to non-knowledgeable, moderately knowledgeable, highly knowledgeable, or completely knowledgeable. By analyzing pre- and post-responses, we could detect if there was an increase in the number of core concepts within a participant's definition and therefore an increase in knowledge. Questions i.2. and s.3. were used to assess the participants' knowledge of IoT green applications and products. By asking the same question pre- and post-event, we could determine whether there was an increase in knowledge of IoT specifically regarding how this technology helps the environment and the existing products to do so.

Data from additional survey questions was also used to assess whether the participant's knowledge increased post-event. Survey question s.2. asked participants to rate on a scale of 1-5 their knowledge before and after the festival and by analyzing these responses we could get an insight on the participants' perception of their knowledge of IoT change. Finally, survey question s.4. also contributed to determining whether participants could recognize the general IoT green applications after being exposed to specific products during the festival.

With respect to criterion number two, *"Attendees' interest in IoT post-event",* our team developed a set of survey questions to sense the level of agreement participants had with certain aspects we defined constituted forms of interest in IoT. These questions were s.7 "Are you more interested in implementing IoT in your field of work or in working to develop IoT solutions as a result of attending this festival?", s.8 "Are you more interested in learning more about IoT as a result of this festival?" and s.12 "How likely would you be to attend this event if it was offered in the future?." We used these questions to determine what percentage of the attendees either strongly or somewhat agreed with these three questions to then draw conclusions on whether there was a high level of interest in IoT post-event.

Finally, in terms of criterion number three, *"Attendees' satisfaction of the event",* we collected data from several survey questions with the objective of obtaining a target Net Promoter Score of +25 which was calculated through the data from question s.11 "How likely are you to recommend this event to someone else?." In addition, we defined high event satisfaction in the form of having over 50% of the participants either strongly or somewhat agreeing to survey questions s.5, s.6, s.10, and s.12. The first two questions "Rate the extent to which this event helped you understand how IoT can be energy efficient and contribute to solving environmental issues" and "Do you believe the festival was effective for learning about IoT and its green applications? If not, explain why, and provide suggestions for other methods?" were intended to determine how satisfied participants were the festival as a method for learning about IoT and the latter two were intended

to determine first, the participants' satisfaction in terms of the participating companies and their presentation methods, and second, the likelihood of participants continuing to attend similar events.

Post-Event Semi-Structured Interview with Stakeholders (GTC, Sponsors, and Participating companies)

In order to assess the effectiveness of the IoT festival from a different perspective, we also studied how the startups perceived the learning opportunities available to attendees. This was completed through semi-structured interviews with representatives of each of the participating startups, and served as an additional method to assess the event's success in reaching its educational goal. By talking with stakeholders about their experience, such as questions attendees had, and how they perceived attendee awareness and interest, we had additional evidence to make inferences about the event's effectiveness. Additionally, we also asked stakeholders questions to gain feedback for how to improve the event in the future. Both sets of questions are detailed in the section below.

Similar to the interview procedure with stakeholders during the activities development stage of planning the IoT event (objective 2), our group conducted follow-up interviews with participating companies and GTC. Our group arranged times to either meet with stakeholders in person or to video call with each respective stakeholder. We completed these interviews the day following the event to acquire relevant perspectives on the success of the festival. These interviews were semi-structured, so questions were prepared beforehand, but we allowed open discussion so that we could observe as much relevant feedback as possible. During the interview, a designated group member took notes, and if the interviewee provided verbal consent, the interview was recorded.

Design of post-event semi-structured interviews with participating companies

The numbered questions are research questions and the corresponding survey questions marked with a "Q" at the beginning.

1. How likely are participating companies to recommend this event to others, specifically, do they believe the event was well organized and represented a good method to raise awareness of IoT?
   Q: Would you recommend this event for other companies to attend? Yes, no, maybe?
   Q: What do you think went well at this event?

Q: What would you improve at this event?

Q: Would you participate in this event in the future?

How the information will help to accomplish the objective:

This information provides feedback for how the event was perceived by participating companies, and enables us to generate recommendations for the future.

2. Do companies providing information and showcasing products increase attendees' interest in and awareness of IoT?

   Q: How interested were attendees in your product? Did they ask follow-up questions after you presented information to them?

   Q: From your perspective, after explaining IoT concepts or details on your products, do you believe attendees gained a clear understanding of the information you were providing?

   Q: Did most participants seem informed about IoT before visiting your booth? If not, do you believe participants understood more about IoT and your product after interacting with you?

   Q: Were attendees aware of IoT's environmental solutions before interacting with you?

   Q: Do you believe attendees identified your product as an IoT product that contributed to reducing environmental issues in some way?

   How the information will help to accomplish the objective:

   This information will provide an additional method to evaluate whether the festival increased the participants' level of knowledge and interest in IoT and corroborates the conclusions drawn from the data collected during interviews and surveys.

Objective 4 Results

The festival took place on April 10th from 2 pm to 6 pm at Technical University of Denmark's Skylab. We had five out of six startups participate, since one of them could not attend the event, showcasing their IoT products that had environmental benefits, and one of the companies was not able to attend. The companies' products focused on different green applications: waste management, energy savings, water consumption, control, and savings, flood damage prevention, and home automation. Throughout the event we had three speakers: a representative from Delta Nordic's IoT center who talked about his rapid prototyping research regarding IoT, a representative from Microsoft who talked about software and cloud of IoT products, and the cofounder of one of the participating startups who talked about consumer IoT and how "we all are green until we have to pay for it".

Figure 7: Attendees Interacting with Startups at the Festival

Figure 8: Attendees at Microsoft Speech

At the festival, 41 attendees checked in, 13 participated in the pre-event interview, 31 completed post-event surveys, and we estimated that around 50 people attended the event. We therefore had a 75% response rate from attendees that checked in, and the results for both the pre-event and post-event methods that match with event success indicators are detailed in the figures below.

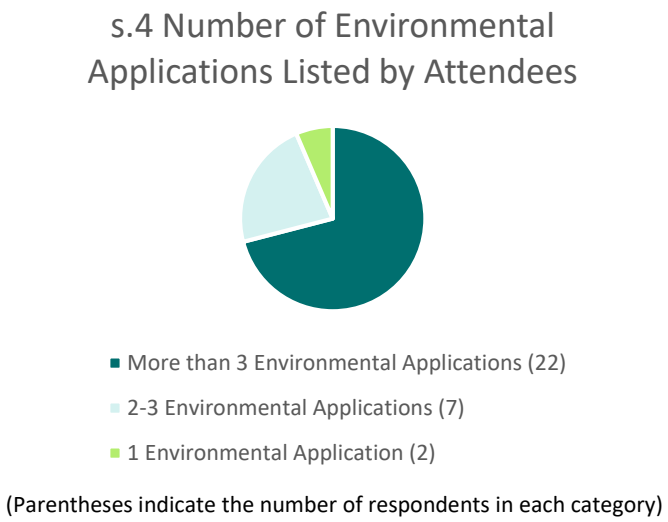
Figure 9 through Figure 12 show results related to our first criterion for event success, which focused on assessing attendees' knowledge of IoT post-event. Figure 13 through Figure 15 show results related to attendees interest in IoT post - event, which address our second criterion for event success. Figure 16 through Figure 18 show results for our third criterion for event success, which address indicators that focused on attendees' satisfaction on the event.

Event Success Results

INDICATOR. Identify at least three green applications of IoT within the fields of energy savings, water consumption control and savings, flood damage prevention, traffic reduction, home automation, or waste management.

SUCCESS DEFINITION. *Over 50% of the attendees should be able to identify three or more green applications of IoT*

1.I.



(Parentheses indicate the number of respondents in each category)

In the post-event survey more than 50% of the attendees' responses demonstrated they were able to identify more than 3 environmental applications of IoT after attending the event. An interesting result is that none of the interviewees included an IoT environmental application in their responses for question "i.2 Can you think of any IoT application or specific product that helps the environment and how?"

Met Success Definition: ✓

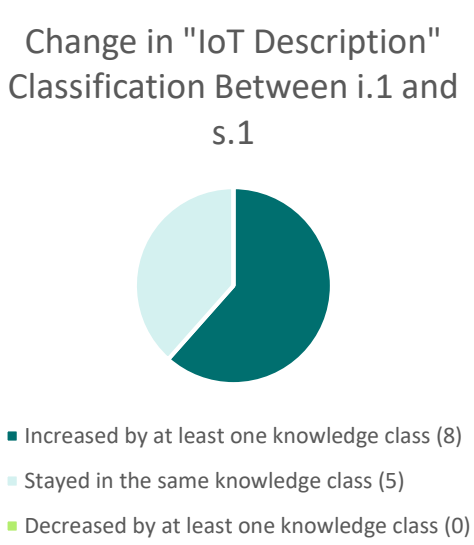
Figure 9: Indicator 1.I Results

1.II.

INDICATOR. Give a complete definition of IoT or at least mention additional core concepts when defining the term after having attended the festival.

SUCCESS DEFINITION. *Over 50% of the attendees should move up one classification in terms of their definition for IoT*

This graph demonstrates that more than 50% of the attendees increased at least one class in knowledge after attending the event using the four class scale (non-knowledgeable, moderately knowledgeable, highly knowledgeable, and completely knowledgeable). In the results from the pre-event interview, no one was able to mention the four key concepts used to classify the levels of knowledge. This graph includes the increase of knowledge for the attendees that were able to mention the four key concepts after attending the event. The graph also represents the percentage of attendees that remain in the same class and indicates no one decreased in their level of knowledge.



(Numbers in parentheses indicate the number of respondents in each category)

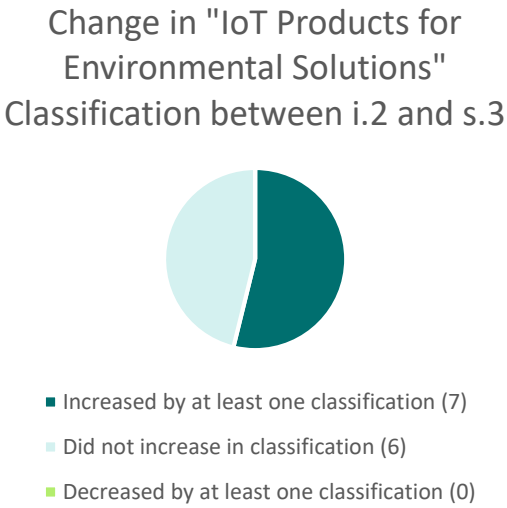
Met Success Definition: ✓

Figure 10: Indicator 1.II Results

1.III.

INDICATOR. Give additional examples of IoT products with green applications after attending the festival.

SUCCESS DEFINITION. *Over 50% of the attendees should move up one classification in terms of the green IoT products they could mention*



(Parentheses indicate the number of respondents in each category)

This graph demonstrates that more than 50% of the attendees increased at least one class in being able to name more IoT products for environmental solutions after attending the event. In the results from the pre-event interview, 57% were not able to list any device that uses IoT for environmental benefits. However, in the post-survey, around 78% of attendees that completed pre-event interviews were able to mention between 1 and 3 specific IoT products that help solve environmental issues.

Met Success Definition: ✓

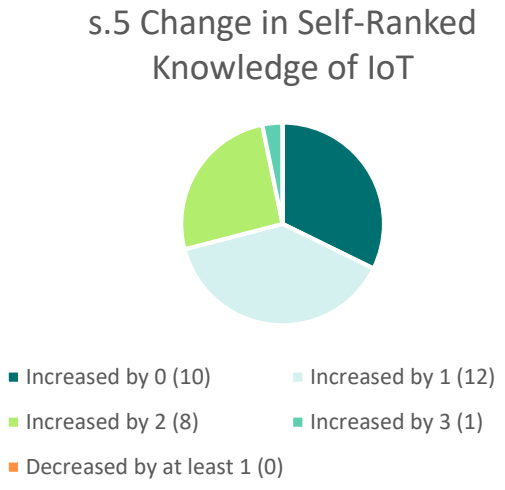
Figure 11: Indicator 1.III Results

1.IV.

INDICATOR. Recognize a positive increase in their knowledge of IoT as a result of having attended the festival.

SUCCESS DEFINITION. *Over 50% of the attendees should perceive a knowledge increase of at least 1 point on a 5 point scale.*

After attendees were asked to rate their knowledge of IoT before and after the event on a scale of 1-5, where 1 indicates no knowledge, and 5 indicates high levels of knowledge. These specific levels of knowledge were left to interpretation by the respondent, since we only calculated the difference between their two answers to see if they perceived a change in their knowledge. As seen in the figure above, 68% of attendees indicated that their knowledge increased by at least one point on the scale.



(Parentheses indicate the number of respondents in each category)

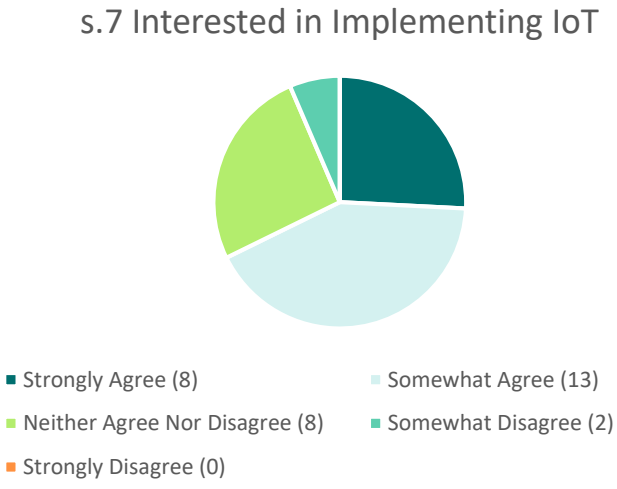
Met Success Definition: ✓

Figure 12: Indicator 1.IV Results

INDICATOR. Give their opinion on whether they would be interested in implementing IoT solutions within their career paths or in working in developing IoT solutions.

SUCCESS DEFINITION. *Over 50% of the attendees should move up one classification in terms of their definition for IoT and the green IoT products they could mention*

2.V.



(Parentheses indicate the number of respondents in each category)

When attendees were asked if they were interested in implementing IoT in their field or developing IoT solutions as a result of this festival, 67% either somewhat agreed, or strongly agreed. This meets our operational definition of success that over 50% of attendees should be interested in implementing or developing IoT as a result of this festival.

Met Success Definition: ✓

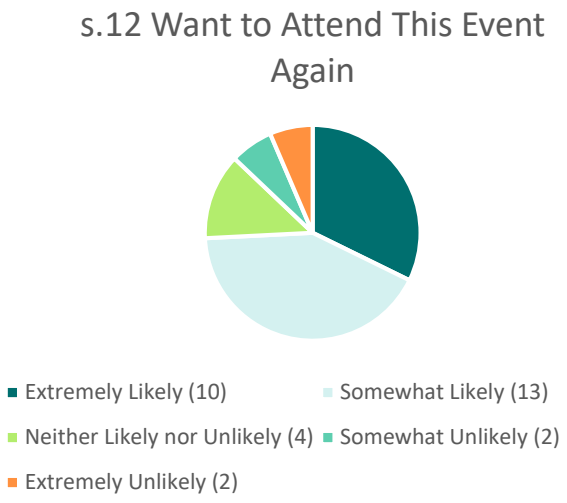
Figure 13: Indicator 2.V Results

2.VI.
3.IX.

INDICATORS. Express desire to attend similar events to continue learning about IoT & Want to attend this event in the future.

SUCCESS DEFINITION. *Over 50% of the attendees should express a desire to attend similar events to continue learning about IoT, and over 50% of attendees should want to attend the event again.*

When attendees were asked how likely they would be to attend this event if it was offered again, 73% responded that they were either somewhat likely, or extremely likely to attend the event again. We also used this information to analyze attendees' desire to attend similar events to continue learning about IoT. This meets both of our indicators that over 50% of attendees should want to attend the event again, and over 50% of attendees should express a desire to attend similar events to continue learning about IoT.



(Parentheses indicate the number of respondents in each category)

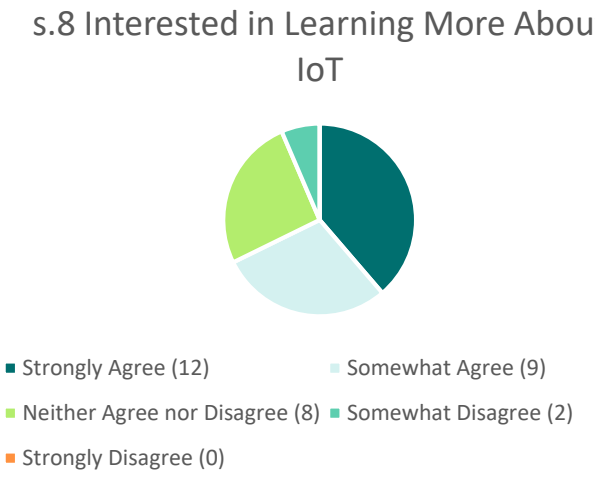
Met Success Definition: ✓

Figure 14: Indicator 2.VI and Indicator 3.IX Results

INDICATOR. Express intention of acquiring more information on IoT and its green applications.

SUCCESS DEFINITION. *Over 50% of the attendees should express a desire to learn more about IoT as a result of this event.*

2.VII.



(Parentheses indicate the number of respondents in each category)

When attendees were asked if they had a desire to learn more about the Internet of Things as a result of this festival, 66% agreed.

Met Success Definition: ✓

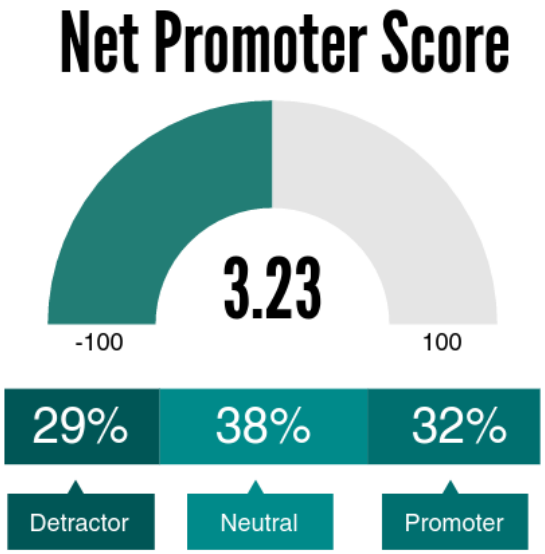
Figure 15: Indicator 2.VII Results

3.VIII.

INDICATOR. Indicate with a 9 or 10 (on a scale of 1-10) they would recommend this event to friends/colleagues

SUCCESS DEFINITION. *The festival should obtain a Net Promoter Score of 25 points on a scale of -100 to 100.*

When attendees were asked to rate how likely they would be to recommend this event on a scale of 1-10, 9 responses were categorized as detractors, 12 responses were categorized as neutral, and 10 responses were categorized as promoters using the Net Promoter Score classifications. When the NPS was calculated, our event received a score of 3.23 on a scale of -100 to 100.



(Parentheses indicate the number of respondents in each category)

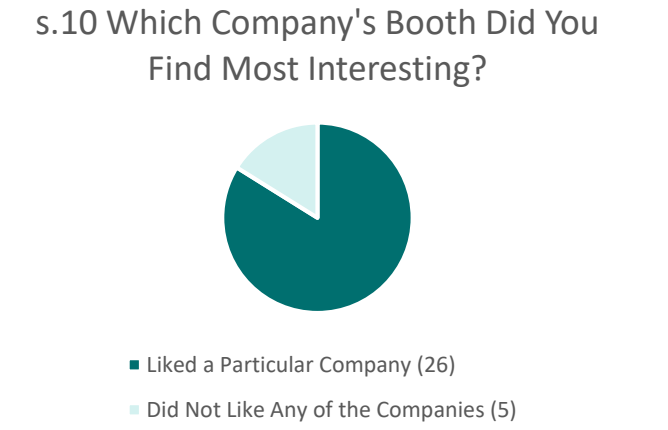
Met Success Definition: ✗

Figure 16: Indicator 3.VIII Results

INDICATOR. Be satisfied with the methods that companies used to present information about their products and IoT.

SUCCESS DEFINITION. *Over 50% of the attendees should either strongly or somewhat agree with the methods companies used to present information.*

3.X.



(Parentheses indicate the number of respondents in each category)

When attendees were asked which booth they found most interesting at the festival, only 16% indicated that they did not like any of the company's booths, while 84% indicated that they liked a particular booth.

Met Success Definition: ✓

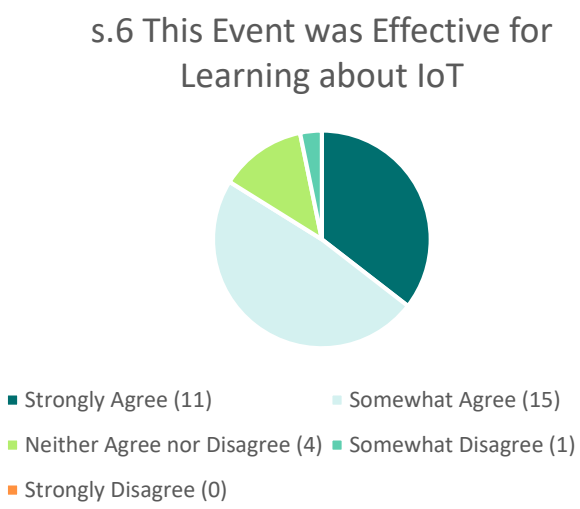
Figure 17: Indicator 3.X Results

3.XI.

INDICATOR. Agree the festival was an effective method to learn about IoT and its green applications.

SUCCESS DEFINITION. *Over 50% of the attendees should agree that the festival was an effective method for learning about IoT and its green applications*

When attendees were asked if they thought that the event was an effective method for learning about IoT, 81% either somewhat agreed, or strongly agreed.



(Parentheses indicate the number of respondents in each category)

Met Success Definition: ✓

Figure 18: Indicator 3.XI Results

Additional Results

In addition to collecting data that corresponds to indicators and operational definitions of success, we also collected data that would give us more insights into the event to provide recommendations in the future. The third question of the pre-event interview consisted of understanding why participant decided to attend this event. As it can be seen in Figure 19, the 50% of participants attended with the purpose of learning about IoT and its green applications. This information would allow us to make recommendations for future events on which kind of activities to perform or maybe change the focus of future events depending on the participant's interest.

Figure 19: Reasons Why Attendees Came to the Event

One of the questions that we asked is how many booths attendees visited. On average, attendees visited about 3 of the booths, and only 6 respondents attended 5 or more booths. One respondent, however, indicated that they did not attend any booths at the event. After looking at their answers other to survey questions, we determined that they had instead just attended the presentations from the speakers, and interacted with other attendees.

Another question that we asked survey respondents is what activity at the startups' booths was most effective for them. We allowed respondents to answer freely, and then counted similar responses to extract useful information. Six respondents indicated that talking with representatives of the company was effective for them, while nine respondents indicated that interactive demonstrations of the product were effective for them. Two respondents indicated that visualizations of important facts were effective, while the rest declined to respond.

We also asked respondents for suggestions on more effective methods for learning about IoT, and suggestions for improvements for future festivals. We received useful feedback from both of these questions, and the results are described in the recommendations section.

Results of Post-Event Semi-Structured Interviews with Stakeholders (GTC, Sponsors, and Participating Companies)

The post-event semi structured interviews with stakeholders was held within one week following the event. The following tables represent the companies' perspectives on both outcome of festival logistics and their interactions with attendees.

Table 9

COMPANIES' FEEDBACK ON FESTIVAL PLANNING					
COMPANY / CATEGORY	Anyaware Solutions	Aqua Robur	Aqubiq	Nordsense	NorthQ
Would recommend the event to other companies	Yes	Yes	Yes	Maybe	Yes
Would participate in future event	Yes, but would prioritize commitments depending on context, focus, and size of the event	Yes, absolutely	Yes, absolutely	Yes	Yes
Positive Feedback	Good organization of event and communication with startup: pre-event meeting, follow up emails, instructions	Good mix of: keynote speakers, exhibition, and interactions with other companies and students	Network with students and companies was very productive. The auditorium location with glass wall allowed them to watch presentations from the speakers	The organization and setup of the event. Smooth transition between speakers sessions. Good venue.	Organization of the event and communication between organizer and startup was very professional. Good networking opportunity
Recommendations for improvement	Add "find a job with startups" focus to engage more students. Host a session with business students as well	Host a bigger event with more participating companies, more attendees, more networking opportunities	Timing: avoid holidays	Timing: host event at least two weeks before or after holiday. Greater attendance of students and mature companies.	Get more companies to participate and encourage attendees to network with each other

The responses from startups indicated satisfaction regarding their perceptions of the event. All startups expressed that they would recommend participation in the event to other companies, as well as participate themselves in future events of this kind. When prompted with the question "What do you think went well at this event?", the majority of the startups agreed that the most beneficial impression was the networking opportunities they had at the event with both student attendees and other participating companies. Additionally, the company representatives stated that events of this type require strong organization and clear communication between organizers and participants, and that they were impressed by both of these components for this event. For future events, the startups generally recommended to have more companies and attendees participate, and hosting the event on a date that will not conflict with a holiday or other event.

Companies were also interviewed regarding their perception of how aware attendees were before visiting their booths and how their knowledge changed about Internet of Things and green application after talking to their representatives. The following table summarizes the startup representatives' points of view regarding the interactions they had with attendees, and these results allowed us to evaluate their perception of the effectiveness of the festival.

Table 10

COMPANIES' PERSPECTIVE ON INTERACTION WITH ATTENDEES

COMPANY / CATEGORY	Anyware Solutions	Aqua Robur	Aqubiq	Nordsense	NorthQ
Attendees' interest in startup	Quite interested. Asked questions about the design and introduced innovative angles to the conversation	Yes, good mix of interactions. Attendees were interested in technical aspects, business models, and marketing of the product	Very interested. Solid conversations with follow up questions. Gave out business cards	A lot of engagement. Students were very interested in the waste control system we presented	Very interested. Asked about how each product worked. Passionate about IoT solutions

Attendees were knowledgeable of IoT before visiting the booth	Had some idea	Quite a few know a lot about IoT	Yes, most of them	50% were engineering who were knowledgeable of IoT, but the other 50% were business students who did not understand the technical definition of IoT	Most of them knew how it worked
Attendees gained clear understanding of IoT application	Yes, attendees understood the innovative angle of IoT	Yes, attendees got a better insight on how IoT products can be applied in different sectors and industries.	Yes, made it more concrete	Yes, it is important students understood the problem and the solution	Yes, attendees gained clear understanding about specific products at the festival
Attendees' awareness of environmental solutions before visiting the booth	Attendees did not have a clear understanding. The link between IoT and its green application is not natural	Attendees had a general idea	Not clear about the connection between IoT and environmental solution	Most of the attendees had an idea	Yes, they had an idea
Attendees understood the application of startup's product as a solution for environmental issue	Attendees identified the solution for environmental issue in an indirect way, especially when the representative did not mention the word green in the product pitch	Attendees were able to identify how the product related to environmental solutions	Yes, attendees understood the connection between IoT and its green application. Very interested in the 15% of water savings gained by the product	Explaining the waste control system and what it entails helped attendees better understand the use of IoT to solve an environmental issue	Attendees were able to improve their understanding and learn how they could save money, but at the same time help the environment

All of the participating companies agreed that attendees seemed very interested in the IoT solutions each of their products presented. Most of the startups responded that some of the attendees already knew what IoT was. However, visiting their booths increased the level of understanding of how IoT was used for specific environmental benefits, whether such information was presented explicitly or implicitly by the startups.

Post-event semi structured interview with Mr. van Deurs

Table 11

MR. VAN DEURS FEEDBACK ON FESTIVAL PLANNING

CATEGORIES	
Positive Feedback	• Overall number of attendees [including startups] around 80 to a 100 better than expected even for the suboptimal date on Easter holidays.
	• Startups' satisfaction: participating companies were able to network with potential stakeholders and possible internship candidates
	• Very impressed with media coverage: more than expected since it was the first time hosting this event there was a lot of uncertainty regarding what to get out from it.
	• Impressive how the festival was hosted without any budget.
Recommendations for improvements	• Timing: suboptimal to host event during Easter holidays since Danes usually take vacations.
	• Schedule presentation speeches for 5 to 10 minutes. It is not efficient to educate people through talks of 30 min or over.
	• Make this festival a recurrent event
	• Startups seemed happy with engineering students, but create a cross collaboration event between Technical University of Denmark and Copenhagen School of Business (CBS) to allow startups to network also with business and marketing students.
	• Engage companies to participate by enforcing the opportunity of network startups would have with possible interns, and offer projects for students.
	• Host event in venue where there are a large number of passersby who might be tempted to visit this event and achieve a higher attendance.
Future participants	• Greater variety of companies: more startups and more large corporations.
	• Phillips, Tesla, among others, might be attractive for attendees as well as startups interested in networking with possible stakeholders. Also, possible financing of the event
Feedback on advertisement	• Great effort in reaching out to student groups in all universities around Copenhagen, Engineering the Future, Women in Tech, and high school teachers. [See Appendix I: Advertising]
	• In the future contact Oikos, the CBS sustainability group for possible partnering in advertisement.

	• Mobilize Green Drinks Network to attend [See Appendix J: E-mail Templates used to contact student and non-student organizations for event advertisement] • Attract students by offering projects with startups • Contact bigger media companies

This table summarizes Mr. van Deurs responses for the post-event semi structured interview. The responses for the positive feedback section demonstrate high satisfaction from Mr. van Deurs since the event outcomes met his expectations. However, he also had some suggestion for future events, especially on how to modify them to cover a larger group of students in both engineering and business areas. He also mentioned some new ideas on future participants in order to attract more attendees to participate in the event. Additionally, Mr. van Deurs proposed new methods of advertisement to even have greater attendance.

Discussion, Recommendations, and Conclusion

Discussion

The two outcomes our team aimed at achieving for this project were first, to raise public awareness of the green applications of the Internet of Things by hosting a festival, and second, to assess the festival's effectiveness in raising awareness of IoT. To accomplish this, we invited startups that utilize IoT technology for solving environmental issues to showcase their products at the festival. In order to achieve our mission, we divided the project up into four objectives.

Our preliminary methods of preparation for the festival included developing criteria to use to assess the effectiveness of the festival, communicating our goals to participating startups, and testing the tools that would be used to collect data at the festival with a pilot event. All of these objectives resulted in a refined logistical framework for the structure of the festival, a set of interview questions that would yield valuable data, and a high level of communication between us and our sponsor, participating companies, and presenters.

Our final method utilized data obtained through pre-event interviews and post event surveys to analyze the change in participants' knowledge of green applications of IoT as a result of attending the event. From this data, we identified a significant increase in participants' understanding of IoT, participants' interest in IoT technology, and a high level of satisfaction after the event from both attendees and participating companies.

Our goal for the Net Promoter Score (NPS) of the event was to obtain a score of 25 or greater. “Based on the global NPS standards, any score above 0 would be considered ‘good’ (50 and above being excellent while 70 and above is considered ‘world class’)”(Severson 2016). Although it didn't reach our goal, a score of 3.23 still classifies it as a “good” event. In addition, when asked for suggestions to improve the event, 12 out of 20 respondents said that they wished the event was larger with more companies in attendance. This indicates that, although detractors were not satisfied with the scale of the event, presumably, they were satisfied with the content. We believe that given more time to plan and invite companies, the event would be bigger and the level of satisfaction would increase accordingly. Nevertheless, this event was successful in terms of its ability to raise awareness of the green applications of IoT.

Our data from the event led us to conclude that a festival is an effective way of raising awareness of the Internet of Things. It yields high satisfaction and interest from both attendees and participating companies. In addition, the event could be scaled up in size and with the foundation we set, we predict that this festival will grow much larger and provide a considerable impact on the IoT community in future years.

In the following section, we describe two sets of recommendations, *Recommendations for Future Research* and *Recommendations for Logistics*. These sections provide insights and suggestions for ways that future projects can improve and build upon the research and logistics that we conducted over the course of this project.

Recommendations for Future Research

This section focuses on ways to improve the research methods of future projects of this nature. In our post-event survey, we asked festival participants what other methods could be employed in place of a festival to raise awareness of the Internet of Things. Most people suggested that a festival was the most effective format they could think of, however, they were able to think of a few alternative methods as well, listed below.

- People could be brought to a location where IoT is implemented to observe the solutions in real time.
- Small booths or informational packets could be set up in locations such as electronic stores, shopping malls, and other places where the product might be sold.
- Discussions or debates could be hosted periodically.
- Speakers could present IoT technology and solutions in schools and universities.

Some of these approaches could prove more appropriate than others depending on the target audience. For example, if a group is trying to attract younger students, then bringing a class

to a location where IoT solutions are utilized could be a more interactive approach for them. Alternatively, if the target audience includes business professionals, perhaps employing a speaker to present to an office would be a more appropriate solution. It is hard to determine whether these methods will result in higher increase in awareness, but **if future groups are interested in researching alternative ways of raising IoT awareness, we recommend considering these options.**

We also asked participants what aspects of the startups' booths were most effective for them to understand the technology being presented. From their responses, we identified that companies whose booths involved engagement with representatives from the company, interactive demonstrations, and visualizations were more effective at presenting their information than companies that utilized only one or two of these tools. **We strongly recommend encouraging companies to utilize these three methods when presenting themselves at similar events in the future.** This can be accomplished by emphasizing the importance of these tools by referencing the results of this study. If the company representatives can be convinced that it is in their own best interest to utilize these tools to increase people's understanding of their product and stimulate public interest in working with their company or technology, then the startups will be more likely to implement these tools.

Raising awareness is a very subjective topic. As we researched about effective ways of raising awareness and about how to assess success in raising awareness, we were unable to find credible data and information. Consequently, we developed a list of criteria with corresponding indicators that altogether would constitute a successful event. When planning any sort of event, **we highly recommend developing a set of criteria the event should meet.** Even if the event will not be assessed, this tool is valuable to keep the organizers focused on the main outcomes they would like to achieve from the event. This method allowed our team to design the festival activities or relay the information we wanted companies to present in the most effective way possible.

Since the festival was a one-time event, our team only had one chance to collect data via interviews and surveys to assess participants' perceptions, interest, and knowledge gains. Hosting a pilot festival with our peers was critical to objectively evaluate our questions and methods for assessing the data tools in order to refine them for the actual festival. We gained valuable insight on which questions participants were confused with, which questions helped us assess the criteria for success, and what answers attendees may give despite our expectations. As a result of the pilot festival, we were able to refine our questions and assessment criteria in order to fully prepare for the festival. **Our team recommends implementing a pilot-test of event data tools for situations where collecting data is critical to assessment and can only be completed once.**

Recommendations for Logistics

This section presents insight and recommendations for future groups to streamline and optimize the planning and logistical aspects of the project.

While working with multiple companies to organize and plan this festival, we found that it was significantly easier to work with startups than large companies, C20 companies, universities, and nonprofit organizations. Since brand awareness, exposure, and networking are particularly valuable opportunities for startups, we found that they were especially eager to participate, very flexible, enthusiastic, and more accessible to work with. Consequently, we noticed that startups generally placed this event as a high priority, which made scheduling meetings and communications a seamless process. **When planning similar events in the future, our team recommends working with startups, especially if the event needs to be organized in a very short timeline (less than 1 month) or with no budget.**

In general, time management and clear scheduling play a key role in the smooth operation of an event such as this. An issue that we ran into was the distribution of time and people between the startup booths and the keynote speakers. Our miscalculation involved scheduling 30 minute presentations every hour for three hours. This became a problem for two reasons. First, nearly all attendees at the event wanted to listen to the speaker presentations. This left very few people in the main area to socialize with the startups. The second issue was that all of the presenters ended up exceeding their allotted 30 minute times. This left participants with about 15 minutes to socialize further with startups before the next presenter was scheduled to begin. We do not recommend eliminating presentations as a solution to this problem because many people told us they learned a lot from those presentations and some came exclusively for those presentations. Instead **we recommend either shortening the presentations to ten minutes or having only one speaker at the end to finalize the event with all the participants' attention.** Larger IoT expos such as IoT World Expo in London and IoT Tech Expo in Germany ended their events each day with either a keynote speaker, a discussion panel, or drinks (Encore Media Group, 2015). **We recommend utilizing one of these methods for ending future events.**

In addition, in our interviews, startups did not indicate that they had interest in networking with other startups during the event. However, by the end of the event, startups told us that one of their greatest takeaways from the event was their ability to network with other startups. Startups appreciated their ability share ideas with neighboring booths and they wished there was a more formal time allocated to allowing startups to network among themselves. For future events **we recommend dedicating time during or after the event specifically to allow companies and presenters valuable networking time.**

All logistical elements that were within our control ran smoothly throughout the duration of the festival. However, the festival goal that we missed by the greatest margin was the number of attendees at the event. Since the event occurred during the Easter holiday break, we knew high attendance numbers would be a challenge to reach and the participants' feedback reflected the same belief. Much of the feedback explained that participants thought that the attendance, impact, and legitimacy of the event would increase dramatically if the event did not occur during a holiday. Planning an appropriate date is a characteristic of logistics planning that should be carefully thought out. **We recommend avoiding any dates for which a large portion of expected attendees are not available.**

Conclusion

Overall, this festival yielded a high increase in knowledge, interest, and participant satisfaction over the course of the event. In addition, startups remained eager to participate through the entirety of the planning process; collaborators such as Microsoft IoT People were enthusiastic and eager to help; finally, various news and media outlets were happy to report about the Internet of Green Things Festival before, during, and after the day of the event. All these factors indicate that a festival is a recommended strategy for raising awareness of the Internet of Things or of similar technical concepts.

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Appendix A· *Establishing a budget and event objectives*

In order to carry out the planning of the festival logistics it is important to define the budget and the objectives of the festival. Frederik van Deurs gave us a budget of zero dollars to host the festival by following the requirements established in objective 1 during our conversation with the sponsor. The main objective of this festival consisted of raising awareness about Internet of Things among students and the general public regarding green applications in regards to energy savings, automation and other environmental benefits. In order to achieve this, the team had to research and contact startups to gauge interest, plan the logistics of the festival, search for sponsorship and C20 companies, and advertise.

Appendix B· *Identifying startups*

We conducted extensive research in order to find Danish startups that use IoT with green applications for environmental benefit. In order to narrow down our search, we contacted Frederik van Deurs for specific contact information from a database of companies that have worked with Green Tech Challenge before. We selected all Danish startups that met the criteria of both using IoT products and focusing on environmental applications. We created a table with contact information of the companies we selected including company name, a brief description of the company products and mission, direct contact names, emails, and telephone numbers. Once the list of eight companies was set, an introductory email was sent two weeks prior to our arrival to Copenhagen on February 20th in order to gauge the interest of the startups participating in this kind of event. The list of companies that were initially contacted can be found below.

Introductory email:

Dear Flemming,

My name is Andrea Karduss and I am a student at Worcester Polytechnic Institute (WPI) in Massachusetts, United States. I will be working with Green Tech Challenge in Copenhagen, Denmark as of March 13th, and with four other students on a project. Green Tech Challenge has given us the mission of hosting a festival to raise public awareness on the Internet of Things (IoT) and its potential to help the environment. We would like the public to understand the green applications IoT can have and the benefits people can gain from using IoT devices.

Our vision for this festival is to have companies that work with IoT or know about its applications present information about IoT in a fun, informative, and interactive way. We envision a range of activities such as formal presentations, hands-on demonstrations, discussions about IoT, and are open to more suggestions. In the end, we want attendees of the festival to learn about IoT, green applications of IoT (e.g., reducing energy waste), and hopefully entice them to purchase IoT enabled products.

I am writing to you today on behalf of my project team to ask if you would like to be a participating company. From our discussions with Green Tech Challenge and research on IoT companies, we believe Urban Water would be a great asset to the festival. The intelligent IoT backwater valve is a very useful device and we believe that your company would intrigue the festival attendees with IoT's applications in everyday life.

We are currently trying to choose a venue and a specified date and time, however, we are aiming to host this festival in the first week of April (April 1-9) in Copenhagen. If your company decides to participate, we would meet with you to discuss how you intend to present information, however, the intent of this e-mail is to gauge your company's level of interest in participating.

We will send any update we can on the date, time, and location of the festival. In the meantime, please let us know if you're interested in being a part of our festival!

Thank you very much,

Jeremy Honig, Andrea Karduss, Jordan Burklund, Maria Sierra Rossi and Liam Shanahan

Table 12: Startup Companies Invited

Startup Companies Invited

Initially Contacted Companies					
Company Name	Description	Contact Name	Contact Email	Contact Number	Status
Sensohive	IoT cloud based sensors	Casper Harlev	casper@sensohive.com	+45 30 20 75 50	Not available
Nordsense	Smart garbage collection	Manuel Maestrini	mm@nordsense.com	+45 41 29 47 61	Participating
Anyware Solutions	Home automation	Morten Bremild	mbr@anyware.solutions	+45 42 40 49 40	Participating + speaker
Wastecontrol	Automated waste bin	Lars Kruse Ravnsbeck	kr@wastecontrol.dk	+45 61 66 72 54	Not available

Spiio	Allow agriculture professionals to make data-driven decisions	Christoffer	chris@spiio.com	+45 24 63 35 11	No answer
SBT Aqua	Bacteria detection in water	Gustav Erik Skands	ges@sbtaqua.com	+45 20 76 57 73	Not available
Aqubiq	Responsible water meters	Peter Nørtoft	peter.nortoft@aqubiq.com	+4522354109	Participating
UrbanWater	Preventative waste water tech	Flemming Lindh	fla@urbanwater.dk	+45 40 41 08 04	Participating
Other Contacted Companies					
Green City Solutions	City tree - clean, cool air	Liang Wu	z.wu@mygcs.de	+49 1762 3164 521	Not available
Interpanel	Multifunctional ceiling systems	Alexander Buff	alexander.buff@interpanel.com	N/A	No answer
Delta Nordic IoT Center	IoT innovation	Morten Wagner	mw@delta.dk	+45 72 19 40 00	Speaker
Art Andersen	Design lab	Jørn Krab	jk@art-andersen.dk	+45 20 70 27 50	No answer
Cleantech	Work with companies on environmental projects	Carsten Orth Gaarn-Larsen	cgl@cleancluster.dk	+45 2323 0000	No answer
NorthQ	Home automation sensors	Izabela Wlodarczyk	iwl@northq.com	N/A	Participating
Aqua Robur	Transforming water energy into accessible energy	Niklas Johansson	niklas@aquarobur.se	+46(0) 70 97 246 69	Participating

Appendix C· *Identifying a venue*

After at least four of the contacted companies replied by the March 13th, the team moved forward to search for a venue that could be rented for free. Due to our limited connections in Denmark, the team asked Frederik for advice regarding what kind of locations or venues we could try to book for free. Following his directions, we had the possibility of reaching out to Microsoft or the Technical University of Denmark (DTU) Skylab. The team contacted the DTU Skylab as the first option since the festival was targeted towards students. The team's rationale for this decision was that we should plan the festival by making it more convenient to students rather than expecting the students to come to the festival at another location. We reasoned that hosting the festival in a university campus would allow us to get greater attendance.

Appendix D· *Setting a date and time for the festival*

The team sent introductory and venue request emails to Paul Pop, a professor at DTU Compute, who directed us to the Head of DTU Skylab, Mikkel Sørensenm. The emailed conversation led the team to schedule a meeting on the first week of the project with Sannie Fisker as Senior Advisor of Entrepreneurship and Pål Simon Fernvall as project manager of the Skylab. The purpose of this meeting was to go over the details of booking the Skylab as a venue. The conversation included setting a time and date in which the venue was available for a six hour period and going over logistics as number of tables, screens, outlets, and chairs needed.

The venue consisted of an auditorium and a ground floor open space of the Skylab. The auditorium was right next to the ground floor, which was ideal for attendees to move back and forth from the startup companies' expositions to the keynote speaker presentations. Due to the availability of the both the ground floor open space and auditorium the venue was booked for April 10th from 1pm to 7pm.

Figure 20: DTU Skylab Ground Floor and Auditorium

During the meeting, the team requested to use tables, screens, outlets and chairs. Pål Simon and Sannie Fisker agreed on also renting out Skylab's tables and transportable screens. After having the conversation with the startups, the team determined that about two tables were required per company and a total of three transportable screens. In the case of needing extra tables during the event, additional tables were available for usage. Additionally, the auditorium was arranged by setting ten rows of ten chairs per row.

Appendix E· *Following up with Companies*

Once we settled the date and time of the venue, the team followed up by both email and phone call with the startup companies already interested in participating in this event. The follow up emails were sent during the week of March 13. The follow up email which included the date and time of the event to confirm availability, to request to schedule a meeting (in person as a preferred method or by phone call as alternative) with each of the startups on the week of March 20th to accomplish objective 3, and to request any multimedia material the companies had for us to use as advertising material.

Concurrently, the team continued to research for new startup companies to replace the vacancies of the startups that were not able to attend the festival. When reaching out to the new startups also found in Table 12: Startup Companies Invited that used IoT for environmental benefits, we sent a new email that already included the final date and time of the event as well as the website for further information.

Follow up email template to participating companies to coordinate meeting time and event logistics.

Dear [Insert company contact's name],

We hope you are doing well. We wanted to touch base with you regarding the Internet of Green Things Festival. In order to finalize all the details and logistics of the event we would like to discuss with you the following topics:

1. Confirmation of date and time: ***April 10th from 13.00 to 18.00***
2. Schedule a meeting with you
3. Request for material to create videos for the festival's advertisement.

Festival date and time:
The Festival is going to take place at DTU Skylab on April 10th from 13.00 to 18.00. This Thursday we will be finalizing these details, but we would like to confirm your availability before doing so.

Schedule Preliminary Meeting:
We would like to have a conversation with you early next week, either in person or by skype call, to discuss all the event planning and logistics, as well as expectations from the event to make sure we are all in the same page. In case you are available to meet in person (which would be ideal) we could come to your office as this is more convenient for you.

Request of Multimedia Promotional tools:
Finally, we will be putting together an assortment of promotional video material for the companies that will be attending this event. We will use this to advertise and promote our event as well as the participating companies before, during, and after the event.

We would really appreciate if you could please attach any multimedia promotional tools (if you have any available) that could help us in producing the videos. This would include short videos, pictures, slogans, or any advertising material.

Attached you can find the flyer with the event information.

Please let us know your availability for next week. Thank you very much.

Best,
[Insert team member's name]

After meeting with the participating companies and following the semi structured interview protocol as stated in Objective 2 Method 3 we sent a follow up email to the interviewed company summarizing all the topics we talked about in the interview regarding the festival planning and logistics. A follow up email example can be found below:

Appendix F· *Sponsorship for the festival*

Due to the budget of zero dollars Frederik van Deurs had given us, we had to search for sponsorship of the event. Our main options consisted of Microsoft and IBM. We had to choose one of these companies because our sponsor indicated that we should contact one or the other to avoid conflict of interest. The team chose Microsoft as a possible sponsor. We reached out to Annette Nørgaard, the head of IoT People. IoT People is a program started by Microsoft that creates meetups attended by professionals and the general public interested in sharing IoT knowledge. Annette Nørgaard invited us to one of the meetups at Microsoft Copenhagen in order for us to network and increase our own knowledge on IoT. The team then interviewed Annette (Supplemental Document page 43) with the purpose of acquiring knowledge on how to run the festival and the possibility of sponsorship. The team also contacted the head of DTU Skylab, Mikkel Sørensenm, as another source of sponsorship who agreed on providing refreshments such as coffee, water, sodas, and snacks. In order to transform our festival into a social networking event targeted towards students and professionals, the team had to reach out to beer companies for possible sponsorship regarding beer for the number of attendees set by Frederik van Deurs requests in Objective 1. This would allow our festival to blend in with Danish culture and increase the level of attendance. The list of beer companies contacted can be found in the following table.

Table 13: Sponsoring Companies Invited

Sponsoring Companies Invited					
Company Name	Description	Contact Name	Contact Email	Contact number	Status
Carlsberg	Beer distributor	N/A	carlsberg@carlsberg.dk	N/A	Not Available
		Christina Hanes	kundeservice@carlsberg.dk	+45 33 27 27 27	
Microsoft	Specifically IoT People	Annette	anno@microsoft.com	N/A	Participating Speaker
Skylab	Free student multi-purpose room at DTU	Sannie Fisker	safi@dtu.dk	N/A	Free Venue
DTU Main Canteen	Food court	N/A	dk92@eurest.dk	+45 45 25 12 71	Refreshments

DTU student run bar	Campus drink Caterer	Erik Pouret-Frydendahl	efrydendahl@pf.dk	N/A	Cheap beer
Sustainable Drinks	Beer at DTU connections to GTC	N/A	pbha@food.dtu.dk	+45 22 37 82 97	Not Available
Royal	Beer distributor	N/A	contact@royalunibrew.com	+ 45 56 77 15 00	Not Available
Thisted Brygus	Beer distributor	N/A	thy@thisted-bryghus.dk	N/A	Not Available
			LONE@thisted-bryghus.dk	+ 45 97 92 23 22	
Albani	Beer distributor	N/A	contact@royalunibrew.com	+45 65 48 75 00	Not Available
Mikkeller	Beer distributor	N/A	info@mikkeller.dk	+45 33 22 79 97	Not Available
Norrebro Sbryghus	Beer distributor	N/A	ordre@noerrebrobryghus.dk	+45 46 55 04 70	Not Available

Appendix G· *Speakers*

The team intended to have three speakers for the festival. The team decided to search for speakers from IoT departments that could talk about their research regarding IoT and the relationship of their research with green applications for environmental benefit. Ideally the three keynote speakers would take different approaches. The three speakers were contacted through email. One of them was a representative of Delta Nordic Group's IoT Department, which was contacted due to his research on sensor prototyping by using Delta's tools. Delta Nordic Group is a total system that supplies solutions for electric and electronic systems in both hardware and software regarding challenging environments. The second speaker, introduced to us by Annette Nørgaard, works at the Microsoft IoT Center and was selected as a speaker for his research and knowledge on large scale software and cloud network applications of IoT with specific examples on green applications. The third speaker was selected from one of the participating startup companies, who was selected for his experience on consumer IoT products as a different business model approach from all the other startups.

Appendix H· *C20 Companies*

Due to our sponsor suggestion the team decided to invite C20 companies, which are defined by the leading index (OMX) of Copenhagen as companies that represent the 20 most traded stocks on the Danish stock exchange (Expat Denmark, n.d.). This list is updated every six months. The aim of inviting at least one C20 company consisted of having them as guest or for networking purposes, which would increase attendance and media attention. The list of the contacted C20 companies can be found in the table below.

Table 14: C20 Companies Invitedwe se

C20 Companies Invited				
Company Name	Description	Contact Name	Contact Email	Contact Number
TDC	Telecommunications	Leeif	lelk@tdc.dk	N/A
		Kristian Kaultwad	krkra@tdc.dk	+45 60 35 00 07
FLSmidth	Engineering ceramics systems	Bent	bent@flsmidth.com	N/A
Vestas	Wind power systems	Prime	trila@vestas.com	N/A
Dong Energy	Energy provider	Gavin	gagre@dongenergy.dk	N/A
		Mette Odgaard	metod@dongenergy.dk	N/A
Carlsberg	Beer distributor	Christina Hanes	carlsberg@carlsberg.dk	+45 33 27 27 27
		Customer service	kundeservice@carlsberg.dk	N/A
Other Companies				
Deloitte	Cloud consulting solutions	Morten Thilstrup Gedberg	mgedbjerg@deloitte.dk	+45 30 93 52 10
SEF Energi	Energy Provider	SØren	soj@sef.dk	N/A
Velux	Automated natural lighting windows	Camilla	camilla.weidemann@velux.com	N/A
Akademikernes	Job placement agency	Adan Ali Khan	aka@aka.dk	N/A

Appendix I: *Advertising*

In order to obtain a high level of attendance and therefore valuable data, a major portion of planning involved advertising. The first two tasks that were needed for advertising were designing a webpage that would contain information about the festival and making flyers that could be used to promote the event on bulletin boards and on social media.

We created the webpage using Wix.com, a website that allows users to build their own websites. We chose to use Wix.com because it has a relatively easy user-interface that allows the webpage creator to add different features such as a Google Map feature that can display any address you input. In addition, Wix.com allows you to publish a webpage for free with their name on the webpage (e.g. Webpage.wixsite.com) or to host the site for a duration of time with different cost options. Our team decided to use Wix.com to host the site for a month for the cost of 12.94 USD and to register the domain name for a year for 16.12 USD so that we would have a more professional platform for advertising the festival, with the domain name IOTGreenFest.com. On the webpage, we included four main tabs: a homepage, a registration page, a schedule page and an "about us" page. On the homepage, we included the logos of the participating companies, the logo from Green Tech Challenge and logos of companies that collaborated with us on the festival. It also included a link to register for the event, a description of the event, a brief overview of the speakers and a link to find out more information about the speakers, and the location, date, time of the event as well as contact information to reach us on social media or by e-mail.

To create the flyers, we utilized Adobe Photoshop and Adobe Illustrator as the means of designing the content and used Piktochart to get high quality graphics that would be used as content in the flyers. Two different versions of the flyer were made; one flyer was more professional and was intended to be used to advertise to professional networks (e.g. startups/companies, entrepreneurial organizations) and one flyer was simpler and was intended to be used to advertise to students. The professional flyer contained more detailed information about the event activities, stating "Learn about IoT and its green applications, Meet green startups and their IoT products, Keynote speakers, …and more!" whereas the simple flyer contained just the keywords "Network" and "Learn." They both contained the logistics of the festival including the website, location, date, time, the company hosting the event and the companies/organizations working in collaboration on the event. See page 47 for the two versions of the flyer. These two

advertising components (the website and the flyers) were completed in the second week of the project.

Figure 21: First Version of Flyer

Figure 22: Second Version of Flyer

After the two main promotional tools were created, our team created a Facebook event on Green Tech Challenge's Facebook page. The event page included the logistical information of the festival including the location, date, time, website, and a brief description of the festival. This event page allowed us to gain insight on the number of people interested in going to the event, the number of people going to the event, and the number of views and people reached on Facebook.

Once the Facebook event was made, we started reaching out to different student organizations and academic departments, startup and entrepreneurial organizations and environmental organizations. In order to find student organizations and academic departments to contact, we researched different universities within the greater Copenhagen and Lyngby regions and then would search for their student organizations/life webpage as well as department heads

that would be relevant to our festival. We compiled a list of each organization, the website or Facebook page that the organization had, the contact information provided on their webpage or Facebook page, and, if available, the names of the people whom we would end up contacting. We followed a similar procedure for finding startup and entrepreneurial organizations and environmental organizations by researching different organizations within the area. We separated the organizations into “student group organizations” and “non-student organizations” As we built up the list of organizations and contacts, we contacted the organizations already researched in parallel.

For organizations with multiple contact sources, we often times would utilize each different form of contact. The easiest way to advertise our event and to ask for additional help in doing so was to call the organization. If the call was successful, we would highlight the phone contact information in pink. If the call was not successful, we made note to call back. In addition, for the organizations we contacted via phone, both successful and unsuccessful calls, we would follow up with an e-mail (if available) to provide a written explanation about the event and to include the two flyers as well.

For organizations without phone numbers, if an e-mail was available, we utilized that means of contact. We created three versions of an e-mail template; one template was geared towards student organizations and academic departments, one template was geared towards entrepreneurial organizations, and one template was geared towards environmental organizations. The template layout included an introductory paragraph to introduce our team and the purpose of our studies in Copenhagen, a paragraph that laid out the details about the festival, a paragraph requested the organization’s help in promoting our event to their network and in obtaining recommendations on other organizations to contact, and a section that included a link to our website, where to locate the Facebook event and that the two versions of the flyer would be included in the e-mail. Once e-mails were sent, we highlighted the e-mail contact information in green.

Appendix J· *E-mail Templates used to contact student and non-student organizations for event advertisement*

The e-mail templates all followed a similar setup, however, three categories were denoted to personalize the messages. The three categories were student organizations, entrepreneurial organizations, and environmental organizations.

Student Organizations:

Hello [insert contact name if available],

My name is [insert team member's name] and I am a student from Worcester Polytechnic Institute in Massachusetts, USA. I am currently in Denmark working with a team of four other students and the Danish startup, Green Tech Challenge, to host a festival to raise awareness on the Internet of Things (IoT) and its green applications.

We are hosting this festival on April 10th at DTU's Skylab from 14:00-18:00. We currently have 6 startups that use IoT attending the festival to present their products, company, and to talk about IoT. We also have three keynote speakers, one from Delta Nordic's IoT Center, one from Microsoft, and a third from one of the participating companies.

We are reaching out to you because we are trying to get the word out as much as possible so students in the area can utilize this amazing opportunity. Students will be able to network with the attending startups, learn about the Internet of Things and get to socialize with other attendees.

We were wondering if you would be able to help us advertise our event to your network of students and to recommend other organizations for us to contact? We would really appreciate the help!

Here is a link to our website: www.IOTGreenFest.com

We have a Facebook event created on Green Tech Challenge's Facebook page.

In addition, I have attached the two flyers we will be using for advertisements!

Thanks!
[Insert team member's name, IoT Team

Entrepreneurial Organizations

Hello [insert contact name if available],

My name is [insert team member's name] and I am a student from Worcester Polytechnic Institute in Massachusetts, USA. I am currently in Denmark working with a team of four other students and the Danish startup, Green Tech Challenge, to host a festival to raise awareness on the Internet of Things (IoT) and its green applications.

We are hosting this festival on April 10th at DTU's Skylab from 14:00-18:00. We currently have 6 startups that use IoT attending the festival to present their products, company, and to talk about IoT. We also have three keynote speakers, one from Delta Nordic's IoT Center, one from Microsoft, and a third from one of the participating companies.

We are reaching out to you because we are trying to get the word out as much as possible so students and entrepreneurs in the area can utilize this amazing opportunity. Attendees will be able to network with the attending startups, learn about the Internet of Things and get to socialize with other attendees.

We were wondering if you would be able to help us advertise our event to your network and to recommend other organizations for us to contact? We would really appreciate the help!

Here is a link to our website: www.IOTGreenFest.com

We have a Facebook event created on Green Tech Challenge's Facebook page.

In addition, I have attached the two flyers we will be using for advertisements!

Thanks!
[Insert team member's name], IoT Team

Environmental Organizations:
Hello [insert contact name if available],

My name is [insert team member's name] and I am a student from Worcester Polytechnic Institute in Massachusetts, USA. I am currently in Denmark working with a team of four other students and the Danish startup, Green Tech Challenge, to host a festival to raise awareness on the Internet of Things (IoT) and its green applications.

We are hosting this festival on April 10th at DTU's Skylab from 14:00-18:00. We currently have 6 startups that use IoT attending the festival to present their products, company, and to talk about IoT. We also have three keynote speakers, one from Delta Nordic's IoT Center, one from Microsoft, and a third from one of the participating companies.

We are reaching out to you because we are trying to get the word out as much as possible so students, entrepreneurs, and people who promote a better environment in the area can utilize this amazing opportunity. Attendees will be able to network with the attending startups, learn about the Internet of Things and get to socialize with other attendees.

We were wondering if you would be able to help us advertise our event to your network and to recommend other organizations for us to contact? We would really appreciate the help!

Here is a link to our website: www.IOTGreenFest.com
We have a Facebook event created on Green Tech Challenge's Facebook page.
In addition, I have attached the two flyers we will be using for advertisements!

Thanks!
[Insert team member's name], IoT Team

In cases where an organization did not have an e-mail address to contact, if available, we sent the same templates via Facebook Messenger. In addition, we posted a promotional post on the Facebook walls of some organizations. Once these messages were sent or posted on the Facebook walls, we highlighted the Facebook contact information in teal. Some organizations did not include any of the above means of contact but did have a contact submission form. For this type of contact, we used the same templates as the e-mail. Once these messages were sent, we highlighted the submission form contact information in dark green. Some organizations had event calendars on their websites that they allowed our team to utilize. Once we uploaded our event to the calendars, we highlighted the website links to the calendar pages in purple. The contact tracking system corresponds to the following:

List of students and non-students organizations

KEY
Green: E-mail
Light Blue: Facebook Messenger
Yellow: Needs to be completed
Pink: Phone Calls
Dark Green: Contacted via contact page
Purple: Calendar event submission

Student Organizations:

- Board of European Students of Technology (BEST): *a non-political and non-commercial student organization, run by students, for students. BEST works to further the communication, cooperation and exchange opportunities for students across Europa.*
    - **Technical University of Denmark**: Homepage: http://www.best.dtu.dk
    - Email: copenhagen@BEST.eu.org
    - https://www.facebook.com/BEST.Copenhagen
    - Response from: wirenfeldtc@gmail

- AIESEC: *The AIESEC experience will enable you to develop leadership skills, gain practical skills, gain international experience, work abroad, and build a personal worldwide network, which will ultimately give you a competitive advantage in any future job.*
    - **Universities within Copenhagen**: https://www.aiesec.dk/unic/ -E-mail
    - **CBS**: https://www.aiesec.dk/cbs/
    - Nishita, e-mail lcp.cbs@aiesec.dk;
    - **Denmark: https://www.facebook.com/AIESECs/**
    - **Automatic Response, call: +45 91 84 67 44 if no reply**

Non-Student Organizations:

- Thinkubator: *Thinkubator bridges established corporations, early stage start-ups, high potential students, and selected knowledge partners to disrupt industry.*
    - http://thinkubator.dk/
    - Email: thinkubator@DARE2.dk
    - Phone: (+45) 2924 5350 / 4181 8151
    - Analisa, e-mail analisa@singularityu.dk

In terms of following up, since we contacted over 100 different organizations, we decided to only follow up with organizations that responded to us as well as organizations with larger networks that would be beneficial to reach, via e-mail. In these follow-up emails, we clarified any questions the organization had.

In addition to advertising the companies attending by including their logo on our website, we created promotional videos of each startup and for the festival itself. We requested materials the startups would like us to include in their video or asked if they had a video already made that they would like us to use. For startups without videos already made, we used Final Cut Pro to create promotional videos. The videos were intended to introduce the companies and included information about their company and their product that utilizes IoT. Each video was approximately 30 to 60 seconds long. These videos were uploaded to the website and were posted on our Facebook event page.

The final component of advertising involved media coverage of the festival including television news, newspapers, magazines, and blogs. We had to research different local news stations and newspapers, magazines pertaining to IoT, the environment, entrepreneurship and other topics related to the festival, and blog accounts that were themed around topics related to the festival. Once we compiled a list of media sources and the contact information they provided,

we followed a similar process as we did for contacting organizations. If available, we called each of the media sources and discussed what we were doing and asked if they'd like to find out more via e-mail. For each successful phone call, we labeled the phone contact information pink. Regardless of a successful or unsuccessful phone call, we followed up via e-mail with a press pitch.

We attended an event hosted by Green Drinks Copenhagen, a group that holds informal sessions about sustainability and the environment, called Green Drinks: Sustainability and Public Relations (Green Drinks Copenhagen, 2017). At this event, Jakob Hessellund (2017) from Kemp & Kjær discussed public relations for cleantech, including how to write a press pitch to gain media coverage. He advised structuring the pitch by having a headline, a sub-heading, an introduction that extended the information in the sub-heading, a quote from you, a quote from your client, and as a bonus, a quote from experts. Following this recommendation, we structured our press pitch in the same fashion, including a quote from our team, a quote from our sponsor Frederik, and a quote from Anette Nørgaard, one of the founders of an Internet of Things meetup group called Copenhagen IOT PEOPLE Meetup. The press pitch corresponds to the following:

Appendix K: *Press pitch for festival advertising*

American students host Denmark's first Internet of Things festival

Five American students are trying to raise awareness on the green applications of the Internet of Things by hosting the first ever Internet of Green Things Festival at DTU showcasing startups, their products, and professionals within the IoT community.

A team of students from Worcester Polytechnic Institute in Massachusetts, USA are working with Danish startup, Green Tech Challenge, to raise awareness on the green applications of the Internet of Things (IoT) by showcasing startups, their products, and professionals within the IoT community. Having arrived in Denmark on March 9th, the team has been vigorously planning the festival, taking responsibility for communicating with companies and creating and distributing advertisement.

The Internet of Green Things Festival is taking place on April 10th from 14:00-18:00 at DTU's Skylab, will showcase green startups and their IoT products with interactive and informative demonstrations, presentations, and networking opportunities.

The IoT Team, Jeremy Honig, Andrea Karduss, Jordan Burklund, Maria Sierra, Liam Shanahan

It's been quite the experience planning a festival in a country we've never lived before. Although we have faced some obstacles, we have high hopes that this festival will become a huge success on DTU's campus and we are grateful for those who have helped us along the way. Our goal is to help increase awareness on what the Internet of Things is and for people to understand how useful this technology can be with aiding the environment.

From left to right: Jeremy, Andrea, Jordan, Maria, Liam

Frederik van Deurs, Green Tech Challenge, Co-Founder and Managing Partner

"We believe that broad implementation of IoT technologies is crucial from an impact perspective. The resources we can save as a society are enormous and the positive effects from a rising degree of automation will have a serious effect on the energy consumption of privates and corporates alike - therefore an IoT festival is important, today most people outside the industry have no idea how much electricity, time, heat, and money they can save by implementing IoT, such as Anyware Solutions intelligent lamp socket, in their homes."

Anette Nørgaard, Microsoft, Next Generation AMM

"For [IoT People], it's about sharing knowledge; making it happen by matching and making it personal for people to meet and learn from each other. So the more we can provide on our website, including your festival…the better…. This [event] is so cool…. It will become the first IoT tech festival.... You're coming from another country and doing research. I think it's a really interesting story"

Appendix L· *Copenhagen Post News Article*

http://cphpost.dk/news/greening-the-internet-of-things-first-ever-festival-to-be-held-at-dtu.html

The Copenhagen Post - Danish News in English

Greening the Internet of Things – first-ever festival to be held at DTU

The Internet of Things is obviously here to stay; a group of US students are trying to raise awareness of its green potential

Jeremy, Andrea, Jordan, Maria and Liam invite you to the first-ever Green Things Festival

April 6th, 2017 11:16 am| by Stephen Gadd

The term ‘Internet of Things’ (IoT) was originally coined by Kevin Ashton of Procter & Gamble in 1999.

It refers to the inter-networking of physical devices, connected devices, smart devices, buildings and other items – all of which contain electronics, software, sensors, actuators and network connectivity that enables the objects to collect and exchange data.

READ ALSO: Tech news in Brief: Faster internet a pricey affair for Denmark

For example, you might have ‘smart’ refrigerators that can monitor consumption and tell the owner when to, for example, order more milk.

Seeing the IoT from a green perspective
However, the IoT has almost limitless potential, and a group of five American students are working together with a Danish start-up, Green Tech Challenge, in trying to raise awareness of the IoT’s ‘green’ applications.

To that end, they are hosting the first-ever Internet of Green Things Festival at the Danish Technical University’s Skylab on April 10 from 14:00-18:00. The festival – which is designed to showcase

green startups and their IoT products with interactive and informative demonstrations, presentations and networking opportunities – is open to the general public.

Potential saving in valuable resources
“We believe that the broad implementation of IoT technologies is crucial from an impact perspective,” explained Frederik van Deurs, the co-founder and managing partner of Green Tech Challenge.

“The resources we can save as a society are enormous, and the positive effects from a rising degree of automation will have a serious effect on both private and corporate energy consumption.”

The student team behind it point out that it has been quite a challenge to plan a festival in a country in which they’ve never lived before. However, although they faced some obstacles, they are confident the festival will be a success.

The important thing is that people understand this technology and see how useful it can be in an environmental context.

Appendix M· *The Local News Article*

https://www.thelocal.dk/20170404/american-students-host-denmarks-first-internet-of-green-things-festival

American students host Denmark’s first Internet of Green Things festival

American students host Denmark’s first Internet of Green Things festival

Michael Barrett
michael.barrett@thelocal.com

4 April 2017
15:05 CEST+02:00

interactive and informative demonstrations,

Photo: Iris/Scanpix

Five American students are trying to raise awareness on the green applications of the Internet of Things by hosting the first ever Internet of Green Things Festival at the Technical University of Denmark (DTU).

The festival, the first of its kind in the country, will showcase startups, their products, and professionals within the Internet of Things (IoT) community through

presentations, and networking opportunities, say its organisers.

The Internet of Things is an umbrella term that refers to devices - other than typical hardware like computers and smartphones - that can connect through the Internet, enabling real-time data collection, analysis, and assessment to occur automatically.

The Internet of Green Things is a natural progression from this concept, says organiser Jeremy Honig.

“IoT is inherently green because it makes processes and products more efficient efficient, reducing energy consumption and aiding water and waste management,” Honig told The Local.

Using smart technology for everyday purposes is not just efficient but can change the behaviour of users through providing them with data, Honig added.

“Just having data telling you how much leaving the heating on wastes makes you more likely to want to save that money and energy,” he said.

The festival will showcase a number of products that demonstrate how IoT technology improves efficiency both directly and organically.

The non-profit event is open to tech and tree lovers alike.

“One company is, for example, showcasing a product that measures the capacity of waste bins, optimises the route for collections and thereby reduces CO_2

emissions," Honig said.

The organisers of the festival - Maria Sierra, Andrea Karduss, Jeremy Honig, Liam Shanahan and Jordan Burklund of Worcester Polytechnic Institute in Massachusetts, USA - arrived in Denmark on March 9th with no budget. They are working with Danish startup Green Tech Challenge to raise awareness on the potential the Internet of Things has for alleviating environmental issues.

READ ALSO: These are Denmark's top ten undiscovered startups

"It's been quite the experience planning a festival in a country we've never lived before. Although we have faced some obstacles, we have high hopes that this festival will become a huge success on DTU's campus and we are grateful for those who have helped us along the way. Our goal is to help increase awareness on what the Internet of Things is and for people to understand how useful this technology can be with aiding the environment," the organisers said in a press release.

Green Tech Challenge said that both the green and technological aspects of the festival made for an ideal collaboration.

"We believe that broad implementation of IoT technologies is crucial from an impact perspective. The resources we can save as a society are enormous and the positive effects from a rising degree of automation will have a serious effect on the energy consumption of privates and corporates alike - therefore an IoT festival is important," said Frederik

van Deurs, co-founder and managing partner of Green Tech Challenge.

The Internet of Green Things Festival takes place on April 10th from 2-6pm at DTU's Skylab.

Share this article

Appendix N· *TechSavvy News Article (Translated to English)*

http://techsavvy.media/amerikanske-studerende-laver-dansk-iot-festival/

Front ╮ tech News ╮ Green Tech ╮ American students make Danish IoT festival

tech News Green Tech

AMERICAN STUDENTS MAKE DANISH IOT FESTIVAL

Of TechSavvy Media - April 7, 2017 0

Five American students will focus on the green aspects of the Internet of Things with IoT festival at DTU. Here, among other Aqubic, Anyware Solution and Aqua Robur showcase their solutions.

Five American students from Worcester Polytechnic Institute in Massachusetts has partnered with Green Tech Challenge to create focus on the green opportunities IoT contains.

On an IoT festival will showcase a variety of green startups, low demonstrations of the products and make sure to get time in the international network at DTU.

IoT can promote a greener everyday

Internet of Things is one of the big trends for 2017, but it is not only solutions that make everyday life easier and link everything up on the Internet for the sole reason that one can. IoT may also help to promote a greener future, says Jeremy Honig, one of the students behind the one-day festival, which takes place on April 10 at DTU:

"IoT

IoT team: From left to right, Jeremy Honig, Andrea Karduss, Jordan Burklund, Maria Sierra, Liam Shanahan

makes processes more efficient and allows for real-time data collection, which can reduce energy consumption, help the water and waste management and encourage people to change behaviors that may be harmful to the environment," he says and elaborates:

"It is often indirect ways, IoT can help the environment, ways that you would not necessarily think about. For example, in products that require a high level of service. A good case in point is NordSenses NS Sensor participating at the festival. The sensor is built-in waste containers and provides information on how full the container is. It can refuse truck as optimize their itinerary for, the only runs for containers need to be emptied. This means less wasted time and less CO2 emissions. "

Green Tech Challenge: "An important festival"

At the festival management teams have selected a number of startups will showcase their solutions; Anyware Solutions , Swedish Aqua Robur , Aqubiq , North Sense, NorthQ and Urban Water . Additionally,

Delta Machinery IoT Center, Microsoft IoT Center, Director of Digital Innovation and IdemoLAB by Delta Morten Wagner and Green Tech Challenge attend.

"We believe that a comprehensive implementation of IoT is essential. We can save huge resources that society and the positive effects of an increasing degree of automation will have a big impact on energy consumption in both the private and public industry. Therefore, we believe that an IoT festival is important. Today, the vast majority of people outside indsutrien no idea how much power, time, heat and money they can save by implementing IoT in their homes, "says Frederik van Deurs, co-founder and managing partner of Green Tech Challenge.

A great experience for the students

Green Tech Challenge has served as counselors at the festival, which originated as part of a project, the stud rendering must make at Worcester Polytechnic Institute. They had read a lot about Denmark's green initiatives and innovative technologies and Jeremy Honig puts it, who would not like to try to hold a festival in another country when the opportunity presents itself?

"It's been a great experience to plan a festival in a country with which we have never lived in before. Although we have had to be some challenges, we have

Tech News · Platfo

GOTIPSTER'S JUST GOURMET FOOD: " TIRED OF LIMP ...

Tech News · Comm

EDUCATION IN ENTREPRENEURSH KICK INTO GREENL GROWTH

great expectations for the festival and hope that it will be a success. We are grateful to those who helped us. Our goal is to create awareness about the potential of IoT and get people to understand that technology can contribute to help the environment, "says Jeremy Honig and IoT team.

The festival will be held April 10 at DTU Skylab. You can sign up for and read more here.