

Dissertation

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Dissertation

The potential of Simulator Racing as an independent sport

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BSc (Hons) Motorsport Management

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Appendix 1: Declaration

I, Todor Stoykov, declare that I am the sole author of this dissertation; that all references cited have been consulted; that I have conducted all work of which this is a record, and that the finished work lies within the prescribed word limits.

This has not previously been accepted as part of any other degree submission.

Date: 31/05/2020

Appendix 2: Form of Consent

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Abstract

This dissertation produces a study on simulator use and knowledge in order to establish the current trends on the subject and identify the future potential of Simulator Racing as an independent sport. The technological advancements in simulators and benefits from their usage in different industries are discussed in the study to evaluate the impact of simulators. The first aim was to examine the changes in the relationship between the Motorsport industry and Simulator Racing which began with simulators being used as a training tool in Motorsports. This is done in order to enhance the assumption making process of how Simulator Racing could evolve in the future. The second objective was to establish the general interest on the topic to predict possible future trends within Simulator Racing. The final target was to collect data about the knowledge and the understanding of Simulator Racing amongst people with all kinds of experience on the subject from professional simulator and real life racing drivers to people who rarely or never used simulators in order to examine if there is lack for understanding and demand for a different approach with Simulator Racing.

To enable the possibility of investigating these objectives, a questionnaire was conducted and distributed in March 2020 on differing social network platforms featuring public forums and specialized Simulator Racing and motorsport forums. After analyzing the statistical primary data that was collected and interpreting the results, the predicted cost efficiency of Simulator Racing was confirmed; the participation and spectatorship interests were evaluated to be high. Moreover, a major void in simulator knowledge was identified between professionals and all other simulator users and a lack of better understanding of the seriousness in Simulator Racing was established with the help of articles. On the other hand, these identifications create a gap for a different perspective on Simulator Racing, given the established trends future predictions can be made about the possibility of Simulator Racing becoming an independent sport.

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1.0 Introduction

1.1 The birth of racing Simulators

Way before racing games and simulators known today, back in the middle of the 1960s, a famous figure from the Formula 1 racing scenery and founder of Lotus, Colin Chapman thought of a new innovative way to promote racing. (Worldofspeed, 2015) He saw the need of identification with racing amongst people that weren't racing drivers. (Worldofspeed, 2015) His idea was to recreate the racing experience for everyone by putting them in a static reproduction of the Lotus 31 Formula 1 car from the same era in front of a screen on which an image was projected, that of a little model car of the Lotus, standing on a rotating disc in order to go through the same movements as the driver. (Worldofspeed, 2015) After designing and building numerous of these marketing devices, Chapman was credited with creating the first ever purpose-built racing simulator which triggered the evolution of this type of machinery through the years with the base Chapman concept remaining till nowadays only using different way more advanced technology. (Worldofspeed, 2015)

1.2 Simulator Racing

Nowadays the simulation software has advanced to the point where it is possible to use advanced tire models with slip angle and sidewall deflection physics, detailed suspension geometry and incredible accuracy in replicating race track with laser technology which provides the most realistic simulation of driving a real race car that is possible. (Motorsport, 2019) Technological advancements allowed simulators to evolve to a point that are now considered a key tool by leading motorsport teams for driver training and car development. (Motorsport, 2019) On the other hand, simulator software is not limited to professional motorsport teams' workshops only, the cost efficiency aspect of simulators allow people to enjoy them from their homes as well. (Motorsport, 2019) This has driven a new type of racing in which anyone with the simulation software has the ability to put their skills against other people online and now highly skilled users have the opportunity to race against the best in the world as well as real racing drivers across different online platforms. (Motorsport, 2019) Sim Racing has broke all viewing records for electronic sports events (Paschall, 2020) with NASCAR's iRacing organized venues with 1.34 million people viewers tuning in for the virtual race at Texas Motor Speedway (Paschall, 2020) which is close to the 1.58 million viewers of the real life racing NASCAR event in 2019 at the Michigan International Speedway. (Paschall, 2020) Not only that the popularity of these events is growing at a rapid pace but with money prize for the winner and enabled betting makes them even similar to real racing venues.

1.3 Objective of the study

This study will focus on establishing the current trends and understanding amongst people in Simulator Racing as well as look at different case studies and articles in order to collect enough data so that analysis could be made over the current position that Simulator Racing takes in the Motorsport and eSports industries. The cited sources in the study provide the needed information to evaluate this position and with the help of the primary data gathered from a questionnaire help to formulate

accurate assumptions of the positives and negatives of the current Simulator Racing situation in the world. The fuel that drives the idea behind this study comes from the evaluation of the potential that Simulator Racing holds and the contrasting current way of conducting those kinds of events. For instance, due to the 2020 Corona Virus outbreak the Indianapolis 500 had to be replaced (Weaver, 2020) by a virtual iRacing IndyCar organized venue. (Weaver, 2020) The iRacing vice president and executive producer expressed his thoughts on how the virtual race went on:

"This was an IndyCar private series with participants exclusively chosen by them. We are not in the business of policing anyone's private leagues for racing issues. Does it suck that he made a mockery of a great opportunity for the series and iRacing? Absolutely."

— Steve Myers May 3, 2020

(Weaver, 2020)

2.0 Review of Literature

2.1 The implementation of computers in Motorsports

Even though, there were great advancements made in technology through motorsports, (McLaren, 2016) that helped pushing innovation in the automotive industry through the decades, it was not until the 1990s when the world saw a rapid jump of computing capabilities. (McLaren, 2016) This led to a significant increase in the usage of computers on the race cars and also in the pit boxes and through the teams. (McLaren, 2016) By the time the mid nineties have passed, computer technology was very much exploited in motorsports (McLaren, 2016) with Formula One having electronic control systems like the active-ride suspension, that used keep the car stable, power-steering was used to help the driver, power-braking was used in order to increase the traction when cars were getting into corners and the traction control systems that allowed the smoothest corner exit that could be possible. (McLaren, 2016) As a result of that more data needed to be gathered from the cars and it had to be analyzed at a higher frequency than ever before. (McLaren, 2016) This role was given to a series of more powerful and faster computers. (McLaren, 2016) To continue with, as technology on the cars advances so does the technology that is used to collect the data and stream it back in the pits where the teams are. In addition the machinery that was used back at the headquarters became bigger and faster. (McLaren, 2016) This marked the beginning of a new era through motorsports, where the ruling bodies in series like Formula One began to restrict the use of assistive technology on cars which increased and enhanced the use of computers in all other areas in the sport. (McLaren, 2016) Today, motorsport series around the world rely on the internet broadband speed that transfers data in order to stream everything from telemetry to television broadcasts. (McLaren, 2016) There is a limit of personnel and amount of technical equipment that can realistically be freighted around the world and this is why teams nowadays have a group of engineers back at every team's headquarters. (McLaren, 2016) These engineers have access to the same data their colleagues have trackside in the pits. Collecting data is essential to the research and development of the cars so real-time telemetry data is streamed across the world when the cars are on the circuit. (McLaren, 2016) The team engineers can analyze together and share simulation data within seconds between the race track and the team's factory. (McLaren, 2016) Speed is from big importance in this process because teams want to make sure that they are getting as much useful data as possible during the short practice sessions during the racing weekends. (McLaren, 2016) The computers used in modern day Formula One teams are top of the range ultra-portable laptops in order to provide access to all the data, simulation and analysis tools that are needed by race engineers in the fastest and error free possible way, because it is critical for the car development. (McLaren, 2016) In order to have the ability to quickly run complex simulations on data from variety of sources the crews back in the factories have high-performance workstations, special software such as the SAP HANA (McLaren, 2016) are used so engineers can search through thousands of laps of data that has been collected in order to find the exact piece of information that will help them with enhancing the car's performance. There are also specially designed hardware groups with tens to hundreds of computers working on complex mathematics called power computational fluid dynamics or (CFD) systems. (McLaren, 2016) These systems are

used for improving the aerodynamic performance of the cars and these systems are responsible for running the simulator that lets the driver develop the car and his driving style outside the track. (McLaren, 2016)

2.2 Simulators' effectiveness

2.3 Aviation Simulator Training

The story of flight simulation dates back before World War II, (Paul L. Myers III, 2018) when in 1929 Edwin Link built his Link Trainer. The machine had basic instruments, no visual display and stand on a primitive motion platform. (Paul L. Myers III, 2018) When the war began, Edwin's device was integrated into the process of training pilots to fly and it was broadly used. (Paul L. Myers III, 2018) During this time period, training accidents were known to occur often and it was believed that the use of simulators could reduce the aircraft accident rate. (Paul L. Myers III, 2018) During the war many technological advancements were achieved, which helped the rapid simulator progress after the war. The development of analog computers was one of the key factors for simulators evolution and around 1949 academic research and studies started on flight simulators. (Paul L. Myers III, 2018) Through the years a major part of airborne training has been replaced by simulator training for both civil and military operators. (Paul L. Myers III, 2018) Technology improvements in simulation resulted in this transition and as it was broadly accepted by regulators and unions, flight simulation became critical to the operation of civil and military organizations. (Paul L. Myers III, 2018) The benefits of simulators in the training aspect of the aviation industry are from great importance. (Allerton, 2010) Simulators provide a safe environment to practice dangerous procedures that should not or cannot be performed in a real aircraft due to their nature, for example an engine failure or rejected takeoff. (Allerton, 2010) The use of simulators has significantly reduced training costs as well as carbon footprint, making a positive environmental impact by preserving resources. (Allerton, 2010) Simulators also serve as a research platform allowing multiple repetitions of different events such as instrument approaches and landings. (Allerton, 2010) These benefits resulted in the implementation of advanced simulators in the Federal Aviation Administration's Advanced Qualification Program. (Allerton, 2010)

2.4 Simulators' application in Motorsports

Nowadays professional racing simulators come with mobile cockpits that recreate car movements, realistic steering force feedback and even helmet-mounted G-Force generators (Silvestro, 2017) in order to simulate the G-Force level that drivers would experience on their neck on the real track. (Silvestro, 2017) As on-track testing is getting less and being more and more limited by the governing bodies of different series in the sport in order to cut costs and be more sustainable. (Newbold, 2018) In the modern era of Motorsports a well-optimized simulator with strong association to the real race car can make a huge difference in performance preparation and could often be the difference between languishing in the mid-pack and being on the top of a race. (Sakamoto, 2014) Simulators used as test beds can be beneficial to racing teams which is why AVL Racing, (Newbold, 2018) a company known for specializing in combustion engines has dedicated to simulating vehicle dynamics and making full-

vehicle test beds. (Newbold, 2018) The company offers their facility to teams and drivers from all top motorsport categories to rent all year round. The test bed provided makes for a realistic experience and it is regarded as the closest experience a vehicle can get to replicate the stress it would experience on its components in competitive conditions without even leaving the facility: "The feedback the pedal gives the driver is real because we are braking the real calipers. (Newbold, 2018) These values are not a simulation anymore, they are real" explains Guillermo Pezzetto in an interview with Autosport, product manager of racing, engineering and technology powertrain systems in AVL and an ex-engineer in Formula 3000. (Newbold, 2018) The manager also adds that the driver can drive the car as close to reality because the next step from their vehicle test bed and driving simulator is reality, the actual real track. (Newbold, 2018) The advantages of simulators and test bed vehicles are really obvious for racing teams, which need to extract the maximum performance from a fixed budget, without the need to go on a real track with a dedicated team with mechanics and a real car. (Newbold, 2018) Formula One teams for example, pushed the simulator technology the furthest with their drivers using simulators to train on daily basis. (Sakamoto, 2014) Racing teams train their regular and test drivers as well as up-coming young drivers on simulators to familiarize themselves with the tracks and the car before they get in the real vehicle on the real track. In the recent decades this trend has been spread around all motorsport series including racing with Touring cars, Stock cars like NASCAR, Rally cars and Sports cars. (Sakamoto, 2014) Drivers across different categories in motorsports agree that simulators help to memorize the track by repeating visual objects like landmarks or different surface and elevation changes. (Sakamoto, 2014) This can be represented as a better position on the track and avoiding dangerous misfortunes in tight areas. Furthermore, simulators are also from great importance to the other members of a racing team. Crew engineers are able to closely analyze how minor changes in the car's setup affect the performance during the preparation for upcoming races in a variety of scenarios and different weather conditions. It is obvious that more changes will take place on the track during the free practice sessions, but the important thing is that the closer a team can get to the perfect setup before they arrive at the physical race track, the better. (Newbold, 2018) In this way teams save resources used on parts, fuel, track reservations and traveling costs, which means there will be more resources to put into research and development. (Newbold, 2018)

2.5 Simulators as part of a racing driver's life

In the past two decades the importance of virtual simulation in motorsports has risen exponentially, it is now used in the process of chassis design, engine design and mostly in preparing the cars and their drivers for the races. (Eagles, 2019) To begin with, Racing Point F1 Team test and simulator driver Nick Yelloly explains that the new type of testing in motorsports is indeed by simulator because it doesn't require real mechanical parts, running cost and travel costs as real life testing. (Eagles, 2019) Racing Point's test driver also explains that normally he and his team spend around 70 days per year on the simulator in order to support the development of the car through the season. (Eagles, 2019) The role that Nick Yelloly and his team are playing is from big importance to the main race team because the gathered data from the simulator is used as a base for what direction should the car

development take. His team makes sure that the drivers have all the information and data they need before heading into qualifying, because post-qualifying all racing vehicles in Formula One must go into parc ferme where any changes to the cars will lead to a grid penalty. (Eagles, 2019) A good example to prove the true worth of simulators nowadays is the case of Scuderia Ferrari in the 2018 Canadian Gran Prix weekend. (Eagles, 2019) After having handling issues on Friday's practice sessions with the car sliding too much and the picture was not looking promising for the Scuderia. But on Friday evening, Alfa Romeo Racing and Ferrari junior driver Antonio Giovinazzi spent a couple of hours in the simulator around the Circuit de Gilles Villeneuve in order to find why the car was sliding so much and seek for solutions. (Eagles, 2019) After a comprehensive study in the simulator the result was pole position in qualifying and race victory for the current Ferrari racing driver Sebastian Vettel. (Eagles, 2019) The 2019 rookie of the year award in Formula One was given to Lando Norris (Hore, 2019) making him the best newcomer to the sport. Whilst his popularity in Formula One is yet to grow, he has been famous for Simulator Racing through his whole career. (Hore, 2019) Norris shares (Hore, 2019) that to this day his favorite hobby is simulator racing and that he started using simulator from very young age while he was racing with go karts and he enjoyed both equally. (Hore, 2019) Simulator racing became Lando's hobby when he was 11 years old and it has become a big part of his life ever since. (Hore, 2019) McLaren's current Formula One driver also points out that simulator racing helped him develop as an actual driver because of the great variety of cars (open wheel cars, sports cars and touring cars) that you can test and race with in racing simulator games, which according to Norris (Hore, 2019) is very useful because of the many different things that a driver learns from driving totally different cars and each one requires a different driving style. (Hore, 2019) Another aspect of simulator racing that helped a lot Lando was the actual racing against other people online. McLaren's indoor simulator racing team named Shadow Project (Hore, 2019) has very talented drivers whom Lando has raced against multiple times and he shares that in order to compete in simulator racing you need to take it as seriously as real and make sure that you are doing everything properly. (Hore, 2019) This means that you need be analyzing your data, looking at your setup, keep good tyre management during the races and think strategically. (Hore, 2019) To continue with, everything from racing with other drivers with different driving styles to learning how a car is set up and learning on which corners one can overtake or not, had been helpful for Lando. The McLaren driver also adds that he races with a lot of real life drivers and how their driving characteristics and habits are the same on a simulator as in real life. For example, the Formula One Red Bull driver Max Verstappen has been racing with Norris on occasions on simulators and when interviewed by (Hore, 2019) Lando shared that you could really distinguish the way drivers drive, how aggressive they are when they make moves to pass or what specific style they have on each track. (Hore, 2019) He explains that this trend can be found in him as well with his tendency to brake too early or too late on certain corners, which helps him figure out all the issues he is having on different tracks and then correct them and improve. (Hore, 2019)

2.6 From virtual to reality

In 2008 a Japanese game for PlayStation called Gran Turismo (GTAcademy, 2015) partnered with Nissan NISMO to create the NISMO GT Academy which is an international virtual to reality contest

that allows the fastest Gran Turismo players to compete in numerous of trials to have the opportunity to become a real life professional racing driver. (GTAcademy, 2015) Any of the simulator racers that proved their skill in the virtual world had a chance to win a spot with Nissan's racing team (GTAcademy, 2015) and get all the needed preparation, training and licenses to race in international events. (Chaloner, 2017) This is the case of Jann Mardenborough, who was preparing to go to university and get a design and engineering degree but in 2011 he managed to get into top 20 from 90,000 people in the GT Academy trials. (Jann Mardenborough, 2015) The finals were hosted at Silverstone International Racing Circuit with numerous of challenges taking place during a period of one week and at the end Mardenborough became the champion. (Jann Mardenborough, 2015) Once he completed the drivers development program so he can get the required license to race he took his first race as a professional in 2012 at the 24 Hours of Dubai racing for Nissan and finishing in third place in his class which was a remarkable result. (Jann Mardenborough, 2015) Then Mardenborough joined Nissan in their British GT and Blancpain Endurance series campaign. Now in the cockpit of a Nismo GT-R GT3 racing sports car he managed to take pole position for the race on the famous Nurburgring GP Circuit and ultimately finishing on third place on race day. (Jann Mardenborough, 2015) Jann was sharing the car with yet another name that emerged from PlayStation and GT Academy racing in the face of Alex Buncombe. (Jann Mardenborough, 2015) Jann and his GT Academy team mate managed to win later the same season at Brands Hatch in front of home crowd. To continue with, they weren't the first or the last to win the GT Academy competition, (Chaloner, 2017) the honor of being the first ever to win the contest was given to the Spaniard Lucas Ordonez (Chaloner, 2017) who went to compete at the toughest and biggest race in the world the Le Mans 24 Hours, (Chaloner, 2017) with the British racing driver Martin Brundle and his son Alex. The NISMO GT Academy winners showed that not only they were very fast in a PlayStation 3 driving simulator but they could transfer their knowledge and skills into real life racing too. Jann is currently competing in the Super Formula series in Japan, (Jann Mardenborough, 2015) one of the closest machines to modern Formula One cars. (Chaloner, 2017) The success demonstrated by the GT Academy winners through the years increased the interest of other manufacturers and teams in the virtual world of racing. (Chaloner, 2017) For example, McLaren have signed a full time racing simulator test driver, who won the 2017 "World's Fastest Gamer" competition. (Chaloner, 2017)

2.7 Simulator racing in eSports

The fast growing eSports industry is becoming more and more popular, as electronic sports' fan base grows continuously and in long term plan it is expected that motorsports may clash with eSports in competition for the fans attention and sponsor acquisition. (Sim Racing business , 2018) Furthermore, eSports are still in an early development process in terms of advertisement but some motorsport organizations view this as a way to engage a younger audience. (Sim Racing business , 2018) To continue with, Formula E and many other series nowadays organize parallel eSports venues during all races in the real life racing season. New platforms are being introduced frequently with rFactor 2 being the most dynamic one and best working for longer races. (Sim Racing business , 2018) Moreover, this platform was used for simulator race venue created by Formula E and Visa in Las Vegas in the same

weekend the actual series was there, which grand prize was \$1 million. (Sim Racing business , 2018) This is by far the largest prize for a simulator race in the history of the sport, more importantly the race was actually made to put professional real life racing drivers from the Formula E series to compete against virtual racing drivers. Racing was closer than ever, for example professional Formula E and Indycar Mahindra driver Felix Rosenquist (Sim Racing business , 2018) went home with \$100k and he was very happy with the result because of how close the race was. (Sim Racing business , 2018)

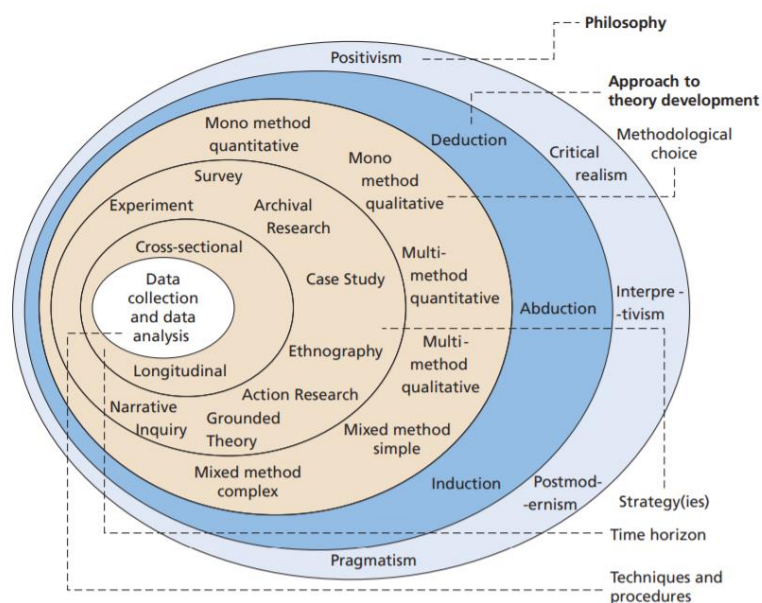
To conclude, technology advances at rapid pace so do racing simulators evolve and become closer than ever to reality. Nowadays simulators are part of the daily training routine of racing drivers and play key role in research and development by being used as a test bed for race cars. To continue with, as the eSports industry grows and its fan base becomes bigger and bigger, importantly most automotive and motor racing series and teams are looking to join eSports. McLaren developed the Shadow Project; Williams developed their own eSports program. (Williams eSports) Racing associations like the ACO that hosts the 24 Hours of Le Mans created their Le Mans eSport series, (Sim Racing business , 2018) NASCAR over in America are working on their eSport series as well. (Sim Racing business , 2018) This is just a slight glimpse of how simulator racing is growing and it looks very promising (Sim Racing business , 2018) with more to come in the Motorsport and the eSports industries in the near future, creating a massive diversity and new opportunities.

3.0 Methodology

The review of literature aimed to provide data background on Sim Racing by acknowledging and evaluating the importance of simulators' role. Following the history of technological advancements in the sphere, questions rise about the possible future impacts and outcomes. This chapter is focused on identifying and discussing the methodological approach, the research philosophies, research paradigm and resulting methods applied in the study. Mark (Saunders, 2019) breaks down the term research philosophy as a system of beliefs and assumptions that we make when developing new knowledge. The assumptions we make are in the core of shaping up the understanding of the research questions, methods and how we interpret our findings. According to (Saunders, 2019) the usage of well-thought and consistent set of assumptions is from great importance in order to build a successful research strategy, data collection technique and analysis procedure. As (Norman Blaikie, 2017) explain, research paradigms serve as tools for different tasks so it is from big importance to find the paradigm that would answer the research question best using ontological and epistemological assumptions.

3.1 Saunders's Research Onion

Saunders created the research onion with the intention to describe the processes and stages through which researchers need to go in order to formulate an effective methodology. (Saunders, 2019) The first layer shows the definition of the philosophy, which develops a starting point for the right research approach, which is illustrated in the second layer. In the third layer, the research strategy is being implemented which leads to the forth step which identifies the time horizon. (Saunders, 2019) The final layer is where the data collection methodology is being identified. (Saunders, 2019) The Research Onion model enhances the process of understanding how the methodological study can be described by illustrating the different methods of data collection as series of stages and steps that should be followed.



3.2 Research Philosophy

According to (Saunders, 2019) in regards of social research, the most vivid aspects of ontology that should be accounted are objectivism and subjectivism. Mark (Saunders, 2019) believes that objectivism embraces realism because objectivism implements assumptions of the natural sciences, pointing out that the social reality that we research is external to different individuals. This means that from an objectivist's perspective, the existence of social and physical phenomena is of independence of the individual's views of them. (Saunders, 2019) It seems like the most sensible way to study them is as if a natural scientist would study nature. From an epistemological perspective, the objectivist approach for discovering the truth about the social world is by observing and measuring facts from which conclusions could be drawn about the social reality. Saunders (Saunders, 2019) also breaks down the subjectivist view point that implements assumptions of the arts and humanities, proclaiming how social reality is created by the perceptions and actions of people, referred as social actors. Saunders (Saunders, 2019) defines ontology as to the assumptions about the nature of reality and explains that our own ontological assumptions shape the way in which we study and see research objects. Therefore, according to (Saunders, 2019) our own ontology, determines how we see the world which shapes our research choices. According to (Saunders, 2019) ontology may seem abstract in situations where the relevance of epistemology is more obvious, even though ontology and epistemology share common views in terms of the assumptions about how the social world is viewed and the available opportunities to increase the knowledge in that world. (Saunders, 2019) Epistemology concerns the assumptions about how knowledge is being generated, achieved and communicated between each other. Moreover, it is our own epistemological assumptions that will follow what we consider to be legitimate for our research. (Saunders, 2019) From an axiological aspect it is important to evaluate the extent to which the researcher views the impact of his own values and beliefs on his research as a positive. Axiology represents the role of values and ethics in the social research. Saunders (Saunders, 2019) also explains that an essential part of epistemology is the structure of acceptance and legitimacy of knowledge. Epistemology is generally connected with the philosophies of positivism, realism and interpretivism, with the positivist perspective opposing the interpretive philosophy and realism being in between the other two philosophies. (Saunders, 2019)

According to N. (Fox, 2008) positivism has a central role to the development of understanding because of the positivist position in the philosophy of science that accentuates the importance of consideration for the growth of knowledge. Saunders (Saunders, 2019) explains how the relationship between positivism and the philosophical stance of the natural scientist involves working with a noticeable social reality in order to produce law-like generalisations. The meaning of positivism comes from the important reference of what is 'posited' which means 'given'. (Saunders, 2019) This highlights the focus of positivism on the strictly scientific experimentation method that is made to collect pure data and examine facts without being influenced by human interpretation or bias. N. (Fox, 2008) points out that positivism could be criticised for denying some sources of understanding of the world, including those collected from human experiences or interpretation as they aren't appropriate for scientific enquiry. The philosophical stance of positivism is closely associated to that of the social scientist

which makes a subjective judgemental approach impossible for the researcher as positivism is associated with getting measurable conclusions of social reality in order to create law-like results. (Fox, 2008) By contrast, post-positivism is described by (Fox, 2008) as having both an epistemological and ontological position; it describes an approach to knowledge and essentially implements the nature of reality at the same time. (Fox, 2008) It also may be looked at as one of the approaches that historically succeeded positivism, one of which is realism, but more accurately it could be represented as a critique of positivist epistemology and ontology, where positivist claims regarding the objective nature of reality and the ability of science to determinate that reality are rejected. N. (Fox, 2008) explains post-positivism as a critique of both ontological and epistemological bases of theories of knowledge. To continue with, the theories of realism and constructivism both acknowledge that the ability of world understanding and knowing is constrained by the need for interpretation when researching data. From (Saunders, 2019) and (Fox, 2008) 's opinions on research theories, it seems like post-positivism stands between the paradigms of realism and positivism which appear very similar in their practical approach. As the observation and measurement of existing objective reality drives the post-positivist approach to developing knowledge, it shapes up as the best approach for building a research strategy for quantitative data. (Saunders, 2019) With this being said, post-positivist approach looks to be the most appropriate when studying the possible future outcomes of Sim Racing whilst taking in account the present knowledge on the subject. (Saunders, 2019) After establishing the correct paradigm and research philosophy, according to Saunders onion, the next step or the next layer on the onion describes the research strategy. (Saunders, 2019) There are two main research strategy approaches; deductive and inductive. (Research Onion – Explanation of the Concept, 2018) The approach used in this study is deductive as it best matches the purpose of the study, because of the adaptation of a theoretical position to the research question which could be examined through data collection and analysis to figure out if the question can be accepted or not. (Research Onion – Explanation of the Concept, 2018) The deductive approach according to (Fox, 2008) is adjusted to contexts where the research project is focused on comparing if the observed phenomena fit with the expectation based on previous research. The connection between the deductive logic and the post-positivist approach allows the formulation of hypotheses as well as statistical testing of expected results to an accepted level of probability. (Fox, 2008)

3.3 Survey

The next consecutive layer in Saunders research onion is the third one and it refers to the research methods that could be used for collecting data. (Saunders, 2019) Due to the need of variety of subjective viewpoints because of the nature of study, the most appropriate research method refers to quantitative. (Saunders, 2019) The best way to quantitatively describe the different aspects and different viewpoints of a given population is by conducting a survey. (Saunders, 2019) As mentioned in (Glasow, 2005), an essential characteristic of the survey research method is how the data is being gathered from people which makes it subjective. In this type of research, the researcher cannot explicitly control the different variables used to define the capacity of study due to their independent and dependent nature. According to (Glasow, 2005) in order to successfully conduct a survey first a

model needs to be designed to identify the expected relationships among the variables because then the survey will be built to test this model against observations of the phenomena. (Glasow, 2005) Therefore before carrying out survey as a research strategy, the researcher should take in to account the main benefits and drawbacks of this type of research.

Benefits:

- Could be developed in relatively short time and are relatively easy to administer
- Cost-efficient
- Capable of collecting broad range of data from large number of responders
- A large number of different questions could be asked about a subject which brings flexibility in data analysis
- Different software packages could be used for more sufficient results and analysis on the data
- Relatively low danger of making errors

(DeFranzo, 2012)

Drawbacks:

- Responders aren't always encouraged to provide accurate information or honest answers
- Regardless of the anonymous nature of surveys, responders may not want to answer questions that could present them in an unfavorable manner
- It is likely for the answers to be unclear on certain question due to how the answer options are interpenetrated differently by different respondents

(DeFranzo, 2012)

In the fourth layer of the research onion, (Saunders, 2019) draws the step in which the best suiting approach for using quantitative and qualitative methods for the research is being chosen. According to (Saunders, 2019) one of the most efficient ways to approach a quantitative research concept is to use a single data collection technique such as survey and matching quantitative analysis. This is why for the purpose of this study a mono methodical quantitative approach is taken. The second to last layer of Saunders onion refers to the time horizon which is the framework within which the researcher intends to finish the project. (Saunders, 2019) There are two known types of time horizons in the research onion: cross-sectional and longitudinal. (Research Onion – Explanation of the Concept, 2018) Due to the study's particular phenomenon being investigated at a specific time the appropriate approach is by using the cross-sectional time horizon in order to collect the data at a certain point. The final layer of Saunders onion represent the actual processes that occur whilst collecting data and analyzing it. (Saunders, 2019) To continue with, the chosen research method for this study being a questionnaire, the next chapter will cover the details and meaning behind the questions used in the survey.

3.4 Pilot Survey

A very important step of conducting a survey is to make a small study in order to test research protocols, research techniques and how efficient the survey is. (Zailinawati A. Hassan, 2006) A pilot study can help identifying potential errors or problematic areas that could have occurred in the research instruments prior to implementation during the study. (Zailinawati A. Hassan, 2006) In order to check of possible errors, a pilot survey was made and given to 3 University colleagues who are not necessarily familiar with Sim Racing. The target of this pilot survey is to indicate the level of understanding of the questions and to establish the time horizon framework for completing the survey. The test study contained 13 close-ended questions and the aim for the survey was to be able to be done in less than 3 minutes as the right timeframe is essential to the questionnaire to insure the quality of the responses. The survey was piloted in March 2020, with the entire test surveys completed and returned. After the respondents' reviews, it was sure that the question formatting was correct and it didn't raise any confusion. The timeframe aim was reached by respondents recording that it took them around 1 minute to complete the survey.

Questions that Measure Knowledge

- One of the respondents suggested that a question to test the respondents' familiarity with the subject should be added in the final survey. Such questions are implemented in order to identify those respondents who believe to be informed and then compare their responses to those who don't believe they are familiar with the subject.

The pilot survey verified its importance by essential feedback that was received, to establish that the questions were easy to understand by the responders and that the timeframe was correct even shorter than expected which opened an opportunity to add a 14th question driven by the suggestion made by one of the responders. There was no need for another pilot survey before conducting the final version.

3.5 Final Questionnaire

After successfully getting through the process of pilot survey, the final questionnaire shaped up. The questionnaire now contained 14 close-ended questions. These questions were designed to collect subjective data from different people in order to gather different perspectives on Sim Racing. In order to recognize different trends and evaluate the familiarity amongst people on the topic, the questions were constructed to describe and evaluate people, test their knowledge and measure their response to ideas. The survey was distributed by using snowball sampling and being uploaded in social network platforms in order to gather responses from different people. The questionnaire was also uploaded in the biggest Sim Racing community forum, to compare the knowledge and interest in the topic between people that have experience. More detailed information behind the questions' design and intended purpose will be listed below:

- The first three questions in the survey have demographic character in order to understand and be able to classify the difference between the responders. The first question is designed to

identify the age group, the second question seeks to find the gender characteristics and the third one aims to give information about the yearly income of the responders. The data collected from these questions will help understand different groups better which will help with analysing the trends.

- Questions number four; five and six are simple dichotomous questions which are designed to determine when either the respondent has any interest or experience on the subject. Question four is set to identify if the individual is interested in Motorsports, question five is asked in order to determinate how popular the subject is amongst people and question six aims to investigate if the responders have any experience with Simulators. Questions nine, ten, twelve and thirteen are also dichotomous and aim to separate respondents based on the opinion they express. Question nine seeks to find out if people think that simulators are a useful tool for enhancing track experience and skills. Question number ten is set to determine the opinion of the respondents on Sim Racing opening new opportunities for those whom cannot afford to do real racing. Question twelve aims to distinguish if people have watched a Sim Racing event before and the next question is designed to establish if the respondents would be interested in watching such an event.
- Question seven was added after the pilot survey and targets to compare the knowledge of those who believe to be informed and those who don't believe to be informed by asking if the responders know how much a professional simulator setup would cost with four multiple choices to answer.
- Questions number eight; eleven and fourteen have a semantic differential scale, with question eight aiming to define how often would one use a simulator, question eleven looks at how likely is for the responders to recommend this form of practice to someone who would want to get involved in racing and question fourteen has a semantic differential scale from 1 to 10 in order to describe the probability of the responders to participate in a Sim Racing event.

4.0 Results and Analysis

The previous chapter focused on described the research methodology and the different research paradigms and strategies used to collect data. In this chapter, raw data results collected from the questionnaire are analyzed and presented with the help of the IBM Statistical Package for Social Sciences (SPSS), in order to establish the differing trends amongst the subjective viewpoints of the respondents and draw conclusions. A total of 137 survey responses were collected after conducting the questionnaire and distributing it to various social network platforms.

4.1 Demographics

This paragraph will describe the frequency and percentage trends in the results from the collected data by age, gender and yearly income.

By age

The largest percentage of the total number of respondents went to people aged between 18 and 25 years old with 40%, people in the age group between 26 and 35 and those over 36 shared similar percentage and those under 18 were only 10%. The respondents that preferred not to answer were only 2 which make them around 1% of the total.

age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-25	55	40,1	40,1	40,1
	26-35	31	22,6	22,6	62,8
	36+	34	24,8	24,8	87,6
	Prefer not to answer	2	1,5	1,5	89,1
	Under 18	15	10,9	10,9	100,0
	Total	137	100,0	100,0	

By Gender

More than 88% of all respondents identified themselves as males and only around 7% as females, around 4% of all respondents preferred not to say.

gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	10	7,3	7,3	7,3
	Male	121	88,3	88,3	95,6
	Prefer not to say	6	4,4	4,4	100,0
	Total	137	100,0	100,0	

By yearly income

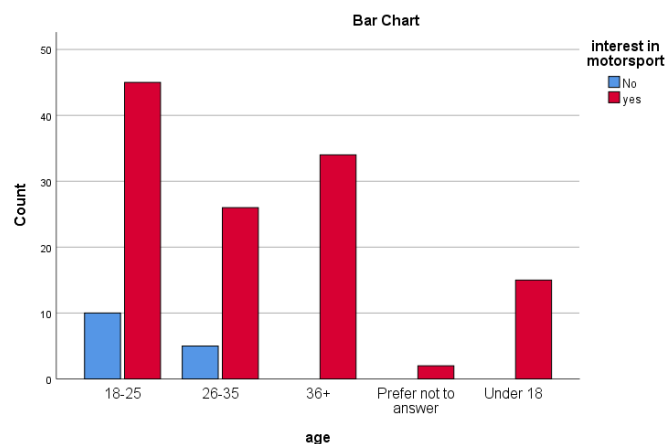
The income group with the highest percentage rate is the one making between £11,000 and £50,000 taking just over 40% of the whole. The second highest percentage rate is in the group that makes between £0 and £10,000 with 27%; the group with yearly earnings between £51,000 and £100,000 is around 10% and only 5% of all respondents stated that they earn more than £100,000 per year. Moreover, around 16% preferred not to mention their income.

		income			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-10 000	38	27,7	27,7	27,7
	100 000+	7	5,1	5,1	32,8
	11 000-50 000	56	40,9	40,9	73,7
	51 000-100 000	14	10,2	10,2	83,9
	Prefer not to say	22	16,1	16,1	100,0
	Total	137	100,0	100,0	

4.2 Interest in Motorsports results by demographics

By age

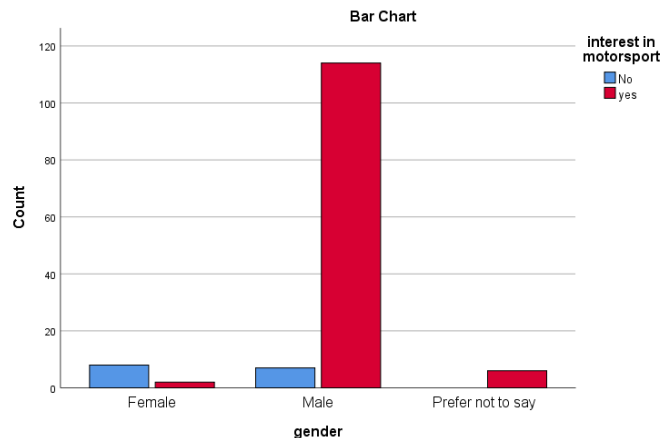
To begin with the frequency and percentage behind different age groups in their interest in motorsports, it can be seen that around 80% of the respondents in the age group between 18 and 25 are interested in motorsports and the rest somewhat 20% are not, a very similar trend is described in the next age group between 26 and 35. All respondents aged 36 or over are interested in motorsports as well as all people under the age of 18. Taking in account the differing trends in interest in motorsport amongst different age groups, it is more likely for people over 36 and those under 18 to be interested in motorsports.



The bar chart illustrates the interest in motorsports between the different age groups.

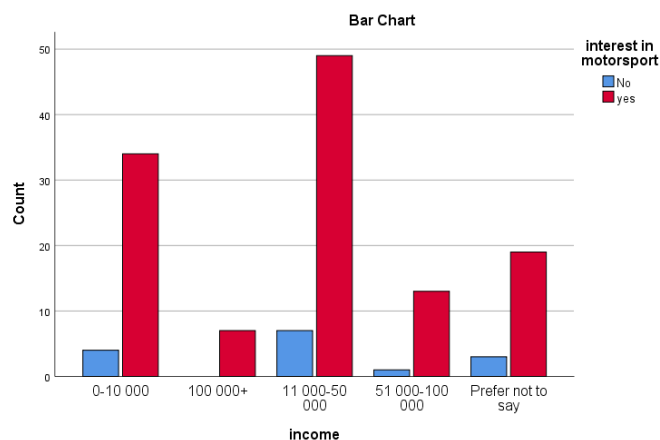
By gender

80% of the female respondents weren't interested in Motorsports, the rest 20% were familiar with the topic. By contrast, around 94% of the male gender group were interested in Motorsports with less than 6% not. To conclude, the presented data shows that men are more likely to be interested in Motorsports than women.



By Income

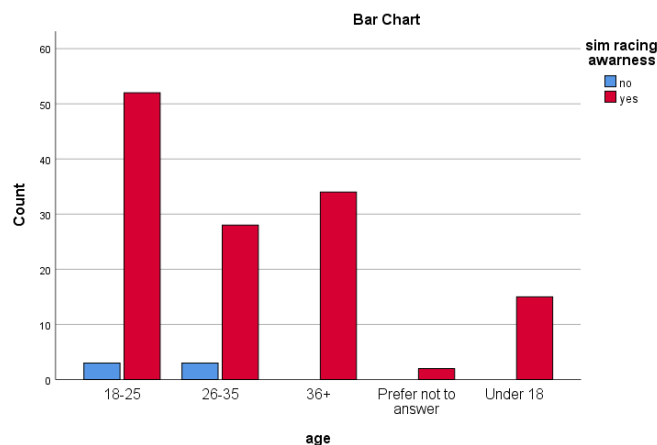
All respondents within the group of those who have a yearly income more than £100,000 are interested in motorsport, the second highest percentage rate is in the group of those who earn between £51,000 and £100,000 per year with around 92% expressing interest in this type of sports and just over 7% answering negative. From those whose annual incomes are between £11,000 and £50,000 a lower percentage are interested in Motorsports at around 87% and the rest 12% aren't. The majority of respondents in the yearly earnings group between £0 and £10,000 have interest in Motorsports with around 89% with the rest not being interested. There isn't a major split in motorsport interest trend within all annual income groups.



4.3 Familiarity with Sim Racing amongst the respondents

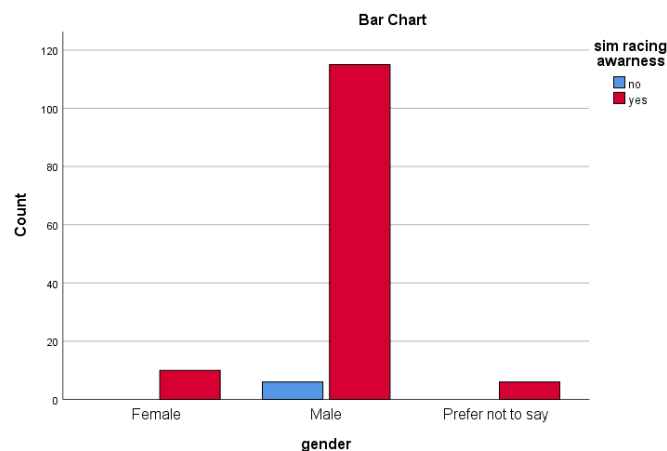
By age

Within the age group of 18-25, around 90% responded that they have heard about Sim Racing before and the rest responded that they weren't aware of the topic. Similar divide can be seen in people between the age of 26 and 35. By contrast, all respondents under 18 are familiar with Sim Racing so do people in the age group over 36. The percentage cut within every group is very similar in favor of those who are familiar with topic which makes it popular amongst almost all respondents.



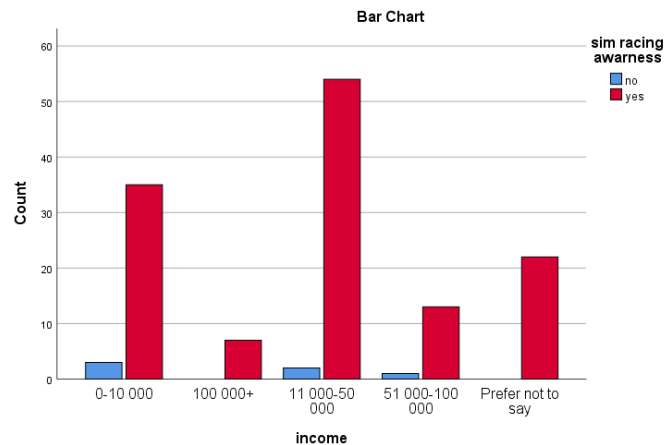
By gender

In the female gender group, 100% of the respondents are familiar with the topic, whilst in the male gender group 95% of all are informed about Sim Racing. By contrast with the data collected from the interest in Motorsports amongst gender groups, there isn't a large difference between both genders in familiarity in Sim Racing.



By income

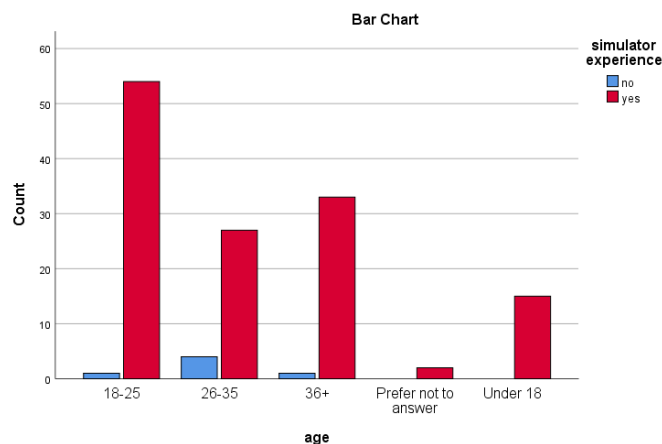
All respondents in the annual income category of over £100,000 are familiar with Sim Racing, of all people with yearly earnings between £11,000 and £50,000; around 96% are attentive about the subject and less than 4% haven't heard of Sim Racing. Both annual wage groups between 0 and £10,000 and the ones making between £51,000 and £100,000 have very similar percentage split within each group with around 90% being aware of Sim Racing. The percentage split within all groups of income is very similar which shows that Sim Racing is not very resource dependent.



4.4 Results for racing games or simulator experiences

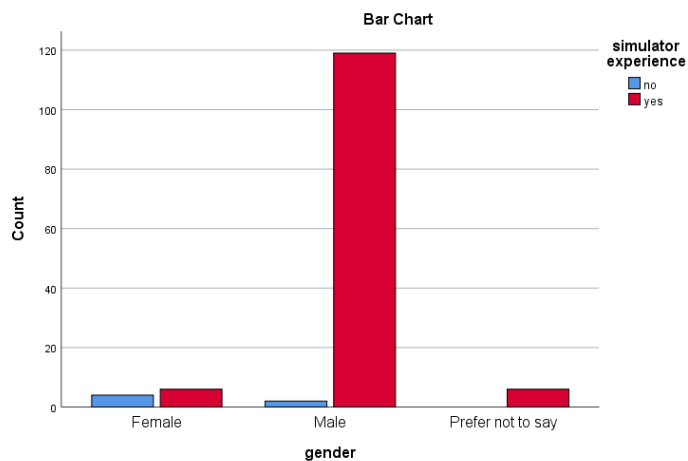
By Age

All under aged respondents confirmed that they had a previous experience with simulators or tried a racing game, 98% of the people aged between 18 and 25 responded with yes and in the age group of over 36, 97% of the respondents answered positive. On the other hand amongst people between 26 and 35, 87% reported some experience on the subject and the rest answered "no". From the data that has been collected it can be seen that people under the age of 18 and those between 18 and 25 years old have the highest expectancy to have had any racing game or simulator experience.



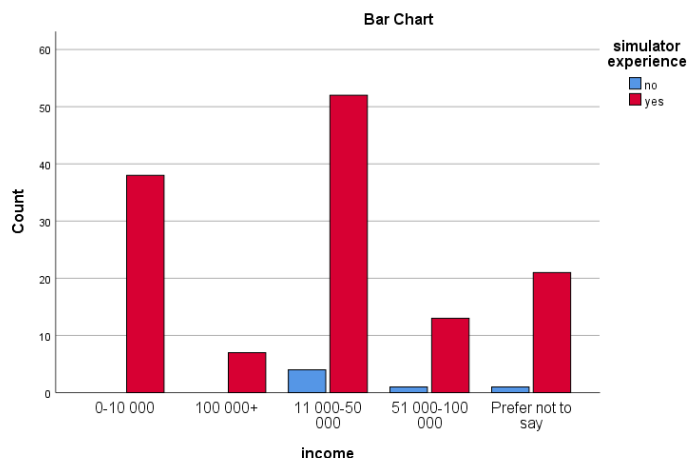
By gender

Within the female gender group the split between those who haven't had any experience and those who have had is not large with 60% of the respondents stating they've tried a racing video game or a simulator and 40% the opposite. In comparison in the male gender group the split between experience and no experience is way bigger with around 98% of the respondents having tried a racing game or a simulator before, and only less than 2% not. 100% of the people who did not want to specify their gender group have had experience with the topic. Judging by the statistics it is more likely for respondents from the male gender group to have any form of simulator or racing game experience.



By income

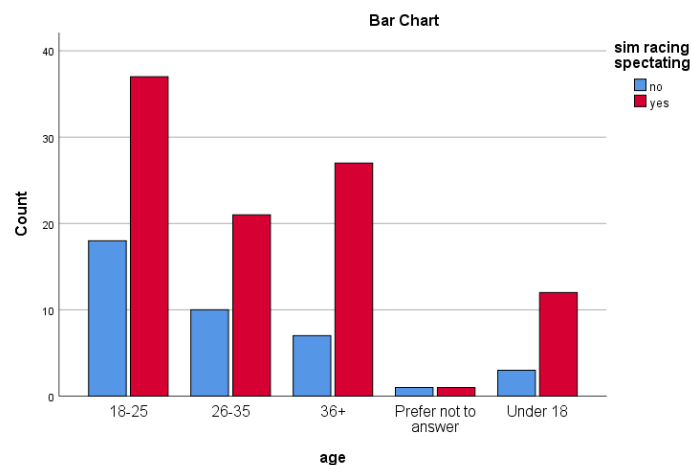
Similar trends are established within all annual earnings groups with those between £0 and £10,000 and those who earn more than £100,000 with 100% of the respondents having experience in the subject. The remaining three groups of yearly income have very similar percentage split with around 90% having experience in racing video games or simulators within each group and with the rest having no experience. With the help of this data it can be concluded that having experience in racing games or simulators is not influenced by the annual income of people, therefore simulators are resource efficient.



4.5 Statistics for Sim Racing events spectatorship amongst respondents

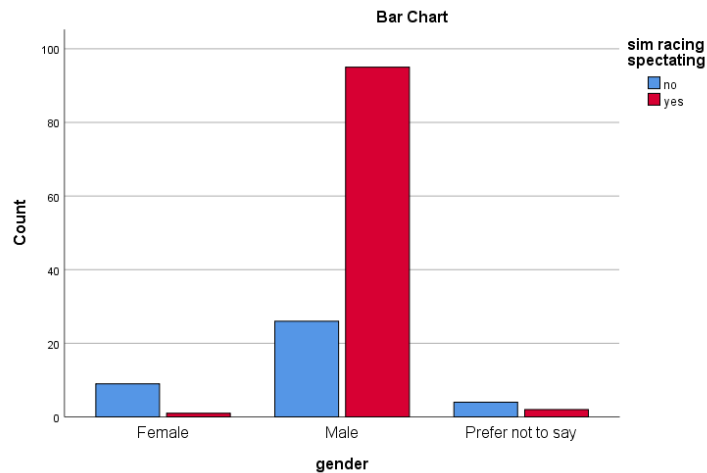
By age

The percentage split within the under 18 group of age has the highest contrast amongst splits in other age groups with 80% of the respondents having watched a Sim Racing event and the rest 20% having not. The age groups between 18 and 25 and the one of people aged between 26 and 35, both have the same split, with around 67% of the respondents in both groups having witness a Sim Racing venue and around 32% in both groups having never witness such event. Around 79% of the respondents in the age group of over 36 have watched a Sim Racing event whilst the rest haven't. Taking in account the percentage split trends in the different groups, it is established that people under 18 and those over 36 are most likely to have witness a Sim Racing venue.



By gender

90% of the female gender group respondents have not witness a Sim Racing event with only 10% of the whole answering that they have seen a Sim Racing venue. By contrast, in the male gender group around 78% of all people have seen such event and less than 22% have not watched a Sim Racing event. From the people that preferred to not say which gender group describes them, around 66% have not witness Sim racing and the other less than 34% having seen such event. Judging by the data statistics it is way more likely for people from the male gender group to have seen Sim Racing venues than the ones from the opposite gender group.



4.6 Analogies

A comparison is made in frequency and percentage terms amongst respondents between the general interest in Motorsports and the general familiarity with Sim Racing in order to establish if there is a relation between both. The statistics show that around 89% of all respondents are interested in motorsport and the rest almost 11% are not. On the other hand, almost 96% of people are familiar with Sim Racing and only around 4% have never heard of the topic. After comparing the data collected from both questions, it is recognized that the percentage of people familiar with Sim Racing is bigger than the percentage of respondents that are interested in Motorsports, which shows that Sim Racing's popularity is not closely related to the popularity and interest amongst people in Motorsports. In fact the data reveals that is more likely for people to recognize Sim Racing than be interested in Motorsports.

interest in motorsport

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	15	10,9	10,9	10,9
	yes	122	89,1	89,1	100,0
	Total	137	100,0	100,0	

sim racing awariness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	6	4,4	4,4	4,4
	yes	131	95,6	95,6	100,0
	Total	137	100,0	100,0	

After observing the gathered data from questions twelve and thirteen which address if the respondents have witness a Sim Racing event and would they be interested in watching such event, a difference in

the frequency is discovered. Statistics from the first question reveal that around 70% of respondents have seen a Sim Racing venue whilst the rest have not. From the second question it is established that more than 78% of people would be interested in watching a Sim Racing event and only around 21% aren't. The difference in the percentage split between both questions tells that more people are interested in seeing a Sim Racing venue than the people that have actually witness such event. This means that the popularity of broadcasted Simulator Racing events is not as high as the interest for spectatorship.

sim racing spectatorship					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	39	28,5	28,5	28,5
	yes	98	71,5	71,5	100,0
	Total	137	100,0	100,0	

interest in sim racing spectatorship					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	no	29	21,2	21,2	21,2
	yes	108	78,8	78,8	100,0
	Total	137	100,0	100,0	

Question number seven aims to examine the knowledge on the topic of those who believe to be informed and those who don't by asking the respondents how much they think a professional Simulator setup could cost, giving them the opportunity to chose between four different options being; £100; £1000; £100,000 and £1,000,000. Whilst racing simulators come with all sorts of setups, in different shapes and sizes depending how advanced they are, they can cost anywhere from £1000 to £1,000,000 (Silvestro, 2017) but the real professional simulator setups used by Formula 1 teams and drivers to gather data and enhance driver's knowledge and skills don't come short from £1,000,000. (Silvestro, 2017) After examination of the statistics from this question it can be seen that only 11% of all respondents knew the right amount of cost, 35% came close by choosing £100,000 as an answer, the biggest percentage cut is generated by people who thought professional simulator setups cost £1000 with almost 50% of the whole. Finally around 3% of the respondents chose £100 as an answer.

professional simulator setup cost

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	100	5	3,6	3,6	3,6
	1000	67	48,9	48,9	52,6
	100000	49	35,8	35,8	88,3
	1000000	16	11,7	11,7	100,0
	Total	137	100,0	100,0	

Taking the results from the question previously discussed, a comparison can be made between the statistics from question seven and how often the respondents use simulators on daily basis, in order to evaluate the relationship between knowledge and practice on the subject. The highest percentage cut from the whole, goes to the respondents that use a simulator regularly with 34%, around 22% of all use simulator every day, almost 12% responded that they use simulator often. Moreover, people who would use a simulator sometimes and rarely have each around 10% split of the whole and those who never used one take 5% of all. After comparing the statistics from both questions it is revealed that 31 of all respondents would use the simulator everyday and 47 would do so regularly, by contrast only 16 respondents knew the real cost of a professional simulator setup. This leads to the conclusion that there is a big knowledge gap on the subject amongst simulator users. This could be led by the fact that Sim Racing is not yet an established trend and that there is a major void in Simulator usage between the masses, the Sim Racing enthusiasts, racers and professionals.

use of simulators

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	everyday	31	22,6	22,6	22,6
	never	7	5,1	5,1	27,7
	often	16	11,7	11,7	39,4
	rarely	14	10,2	10,2	49,6
	regularly	47	34,3	34,3	83,9
	sometimes	15	10,9	10,9	94,9
	usually	7	5,1	5,1	100,0
	Total	137	100,0	100,0	

After taking in account the data from the last question, it can be compared with the data collected from responses to the question when ether people find simulators to be useful in terms of enhancing driving abilities and track knowledge by using a cross tabulation. The percentage split is very similar amongst all respondents with around 90% to 100% revealing that they believe in the effectiveness of simulators. The only group of respondents with more differing percentage split is the one in which they never use a simulator but even within this group around 57% presume that simulators are effective for enhancing the driving abilities and the rest less than 43% don't think so. This shows that respondents are much aware of the proven effectiveness of simulators. To continue with, the probability of how likely is for people to use simulators can be examined with respondents guess when ether simulators

open an opportunity for people who want to race but cannot afford to do so in real life. All respondents that use a simulator every day, usually or often, think that simulators can open an opportunity for racing outside of the real world. A similar trend is observed amongst almost all other groups with percentage splits always around 90% in favor of the respondents that believe in the convenience of simulators. On the other hand, the only group with different percentage cut is the one with respondents who never used a simulator with around 85% within it, suggesting that simulators don't open an opportunity and the rest answering "yes". This means that people who actually use simulators found the benefits of this technology and see the progress, more interestingly, not only people who use it on daily basis or regularly but even people who use simulators sometimes and rarely.

A similar trend can be examined when respondents were asked how likely is for them to recommend simulators to somebody that looks to get into racing. As much as 53% of the whole is taken by the group of people who are extremely likely to recommend simulators, the second highest percentage split is for the group of respondents that are somewhat likely to recommend simulators with 24% and those who answered neither likely or unlikely are around 10% of the whole. The rest percentage split is to those who are extremely unlikely or somewhat unlikely to recommend simulators with each group having 5.8% of the whole. Respondents are more likely by far to recommend simulators to somebody who would want to do racing that the opposite, even people that do not use simulators everyday or have somewhat of a professional experience. This shows how recognizable the potential of simulators to improve driving skills, track knowledge and overall racing performance, is. Frequency statistics are illustrated on the table below:

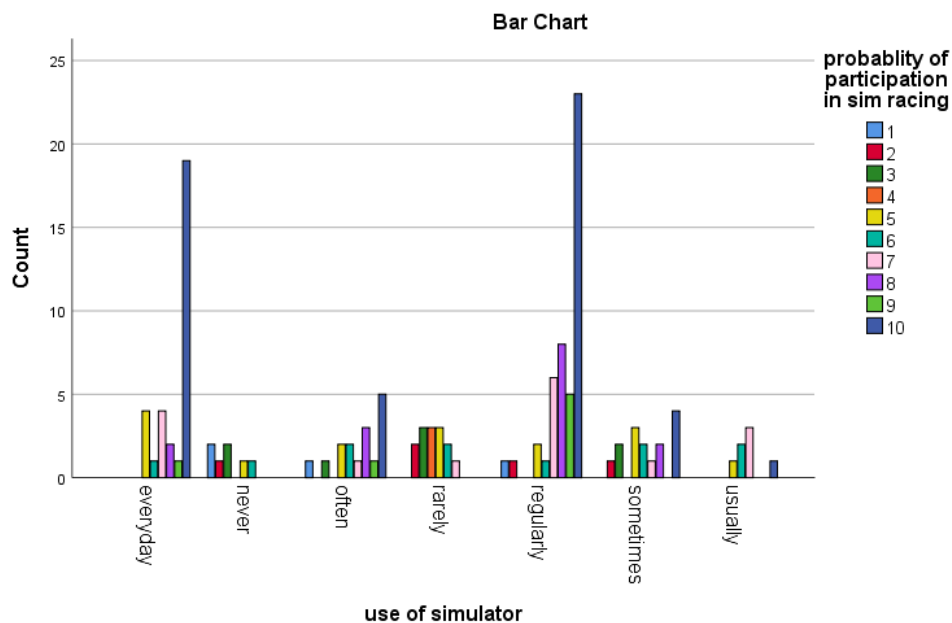
simulators recommendation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	extremely likely	73	53,3	53,3	53,3
	extremely unlikely	8	5,8	5,8	59,1
	neither likely nor unlikely	14	10,2	10,2	69,3
	somewhat likely	34	24,8	24,8	94,2
	somewhat unlikely	8	5,8	5,8	100,0
Total		137	100,0	100,0	

Finally, people were asked to evaluate how likely is for them to participate in a Sim Racing event, with a scale from 1 to 10 with 1 being extremely unlikely and 10 being extremely likely. The highest percentage cut from the whole is to respondents that choose extremely likely with 38%. 5 and 7 on the scale share the second highest percentage split with around 12% each. However, the lowest percentage cuts are towards extremely unlikely and the lower numbers of the scale. This reveals that the interest in participating in a Sim Racing event tends to be extremely likely.

probability of participation in sim racing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	4	2,9	2,9	2,9
	2	5	3,6	3,6	6,6
	3	8	5,8	5,8	12,4
	4	3	2,2	2,2	14,6
	5	16	11,7	11,7	26,3
	6	11	8,0	8,0	34,3
	7	16	11,7	11,7	46,0
	8	15	10,9	10,9	56,9
	9	7	5,1	5,1	62,0
	10	52	38,0	38,0	100,0
	Total	137	100,0	100,0	

The bar chart below illustrates how likely is for people with different consistency in simulator use to want to participate in Sim Racing events. Again the trend in almost all groups tends to be in the upper end of the scale towards extremely likely. It can be seen that no matter of the amount of experience or dedication that individuals have or have put into simulators, they all seem to evaluate the impact that simulators have and distinguish the future potential that Sim Racing has. This speaks for the level of interest amongst respondents on the subject.



5.0 Conclusion

5.1 Recognizable trends

The aim of this study is to examine the potential that Simulator Racing carries to become an independent sport in the future. Primary research was conducted via questionnaire, in order to establish the current trends in knowledge and interest on the topic. After analyzing the collected data, numerous trends were established, firstly with a difference between the interest in Motorsports and familiarity with Sim Racing between genders, with male being more likely to be interested in Motorsports, whilst both genders being equally familiar with Sim Racing. As Sim Racing was born in the motorsport industry, embraced by technological advancements it is fair to point out that to a certain degree, Simulator Racing has separated itself from Motorsports. After analyzing data regarding how different annual income between respondents relates to familiarity, interest and experience in Sim Racing it can be concluded that none of these aspects are majorly dependent on resources. Moreover, it is established that simulators are broadly available no matter of the income group that people fall into, thus Sim Racing is resource efficient, which cannot be said about real life racing. The analysis confirm that even though the most expected age groups to have had any type of experience with simulator are the ones aged below 25, there is interest demonstrated in the desire for watching Sim Racing venues from all different age, gender and experience. Moreover, the results and analysis prove the effectiveness of simulators, not only respondents that use simulators regularly were extremely likely to recommend this type of practicing to somebody who would want to do racing, but even those who have tried a simulator once, or use rarely. A potential for driving skills improvement and track knowledge improvement is highly recognized amongst respondents as well as all other benefits supporting simulators. The statistics reveal that the majority of respondents are highly interested in participating in a Sim Racing event, even with respondents that don't necessary have great experience on the topic, still tend to be somewhat interested.

5.2 The void for serious Simulator Racing understanding

As statistics demonstrate the knowledge gap amongst respondents between normal simulators and professional setups, it tends to be similar about the way Sim Racing venues are being mistaken with commercial esports video game events. Due to the recent events regarding Covid-19, all kinds of racing events had to be postponed or cancelled if they could not be rearranged. (Dixon, 2020) This made series like Formula One to turn into esports (Dixon, 2020) in order to fill the gap that have opened in the calendar. Formula One is using their official Formula One PC video game made by Codemasters. (Dixon, 2020) Unfortunately, the Formula One game could never even get close to replacing the real life races due to its arcade game character. (Collantine, 2020) As Lando Norris explains (Collantine, 2020) the feeling through the steering wheel that drivers get in the game cannot be compared with the real car feeling. (Collantine, 2020) Moreover, this is the reason for Max Verstappen to not join the Virtual Grands Prix. (Collantine, 2020) Lando also explained that he would not recommend this game to any serious racer but definitely suggested iRacing as great simulation

software. (Collantine, 2020) By contrast with Formula One, NASCAR chosen to run their virtual racing series on iRacing (Paschall, 2020) and to display how serious NASCAR treats Sim Racing, driver Kyle Larson was fired Chip Ganassi Racing; (Associatedpress, 2020) just one day after most of his sponsors dropped him for the use of racial slur during a virtual race. (Associatedpress, 2020) His entire career fell (Associatedpress, 2020) as main sponsors in the likes of McDonalds and Credit One Bank pulled back their funding. (Associatedpress, 2020) The six times NASCAR race winner had his relationship with Chevrolet suspended as well. (Associatedpress, 2020) Later in the virtual series the driver of the #43 Chevrolet Camaro, Darrel Wallace faced a similar penalty for exiting a race prematurely before the end because of moment of anger due to participating in a tangle with other drivers. (Evans, 2020) NASCAR Series partner Blue-Emu terminated its sponsorship of Wallace after the race. (Evans, 2020) But unluckily even the use of good software like iRacing does not prevent the incompetence that occurs when the risk of real life racing is not there. In the iRacing IndyCar challenge, the Formula One driver Lando Norris made a three-wide overtaking attempt on the inside with Graham Rahal in the middle which left Pagnaud on the outside (Weaver, 2020) and made him crash into the barrier. (Weaver, 2020) After Lando had taken the lead with two laps to go, Pagnaud slowed down before getting lapped and deliberately moved directly into Norris' way, (Weaver, 2020) which resulted in a crash. When Pagnaud went into the pits he made his intentions clear on his live stream that he wanted to take Lando out. (Weaver, 2020) After examining the footage with Norris, his friend and colleague Max Verstappen expressed his disappointment in Pagnaud's actions. (Weaver, 2020) Moreover, the vice president and executive producer of iRacing concluded that the incidents in the race "made a mockery" (Weaver, 2020) of the platform and no suspensions were executed only because of the private nature of the event that was hosted and promoted by IndyCar. (Weaver, 2020) The vice president also added by stating an article from iRacing's sporting code: "deliberate, intentionally malicious, or retaliatory wrecking is prohibited." (Weaver, 2020)

5.3 Summary

To summarize, through the years racing simulators evolved with the help of technology. Technological advancements have a progressive trend which means that as long as technology evolves simulators will advance as well. This study established the benefits of simulators in terms of usefulness, effectiveness and cost efficiency. Moreover, it identified the current position of Simulator Racing which started within the Motorsport industry and leaned towards the eSports industry in recent times. It was examined that there is a major general interest in Simulator Racing, both in participation and spectatorship. The impact of Simulator Racing can be seen in a crisis situation in case of a pandemic and real life racing events cancelation. However, these events revealed a misconception of how Simulator Racing venues are being treated and organized. In order to extract the full future potential of Simulator Racing to become a serious independent sport it must separate itself from the politics and commercialism of the eSports industry.

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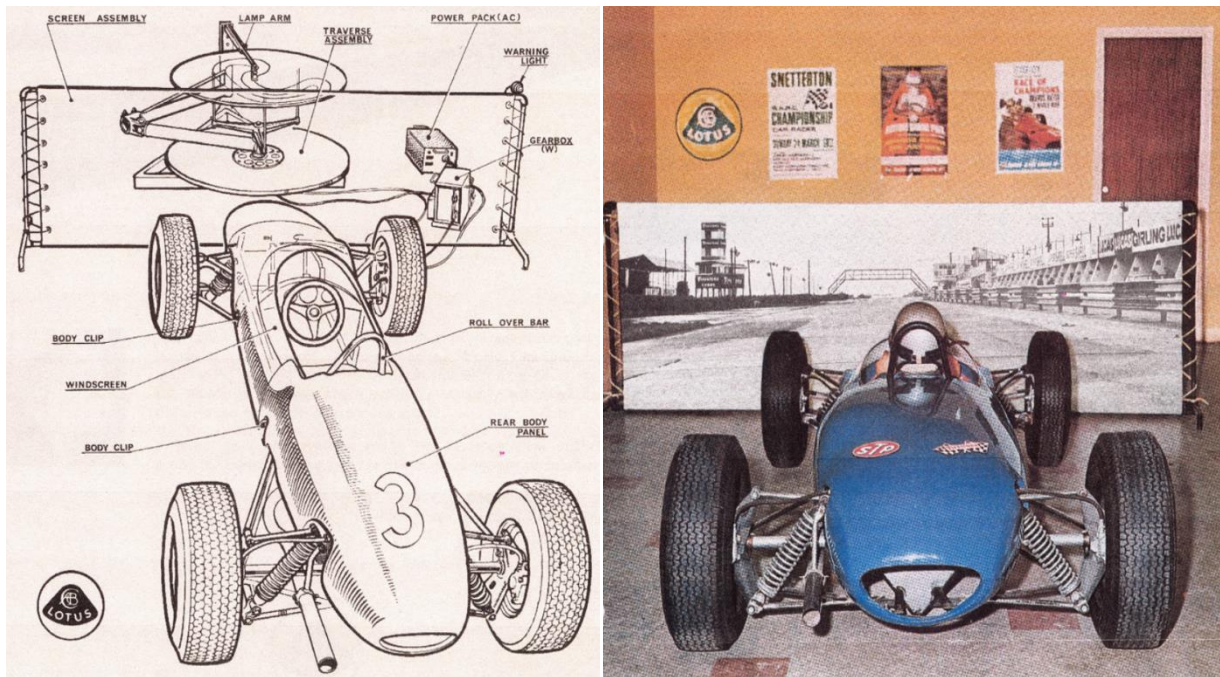
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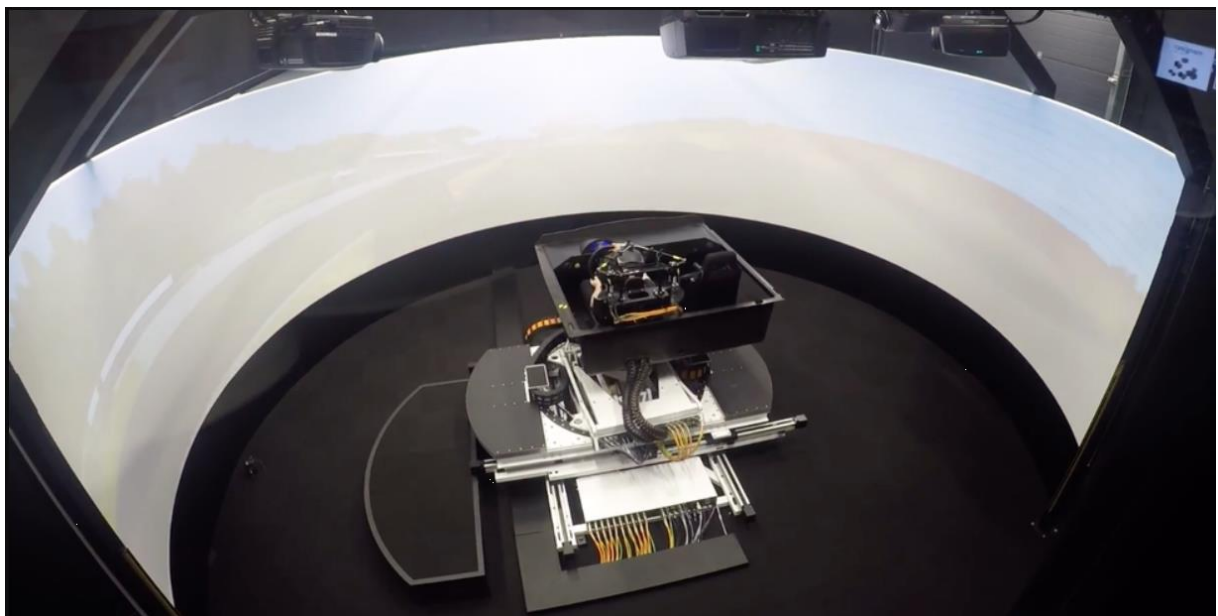
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Appendices

Appendix 3 – Study related pictures



Colin Chapman's first ever Racing Simulator (Worldofspeed, 2015)



Professional Racing Simulator (Silvestro, 2017)

Appendix 4 – Questionnaire copy

Sim Racing

Questionnaire

1. Which age group describes you?

Under 18 | 18-25 | 26-35 | 36 +

2. Which gender group describes you?

Male | Female | Prefer not to say

3. Which of these describes your yearly income the best?

£0- £10,000

£11,000- £50,000

£51,000- £100,000

£100,000 +

4. Are you interested in Motorsports?

Yes | No

5. Have you heard of Sim Racing before?

Yes | No

6. Have you ever tried a racing game or a simulator before?

Yes | No

7. How much do you think a professional simulator setup cost?

£100 | £1,000 | £100,000 | £1,000,000

8. Rate how likely you are to use a simulator

Everyday | regularly | usually | often | sometimes | rarely | never

9. Do you think simulators can be useful in terms of enhancing your driving abilities and track knowledge?

Yes | No

10. Do you think racing simulators open an opportunity for people who want to race but cannot afford to do so in real life?

Yes | No

11. How likely would you recommend racing simulators to somebody who looks to get into racing?

Extremely unlikely

Somewhat unlikely

Neither likely nor unlikely

Somewhat likely

Extremely likely

12. Have you watched a Sim Racing event before?

Yes | No

13. Would you be interested in watching a Sim Racing venue?

Yes | No

14. How likely is it for you to take part in a Simulator racing event if 1 is extremely unlikely and 10 is extremely likely?

1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

Appendix 5 – SPSS Cross tabulations

Interest in Motorsports results by demographics

age * interest in motorsport Crosstabulation

			interest in motorsport		Total
			No	yes	
age	18-25	Count	10	45	55
		Expected Count	6,0	49,0	55,0
		% within age	18,2%	81,8%	100,0%
	26-35	Count	5	26	31
		Expected Count	3,4	27,6	31,0
		% within age	16,1%	83,9%	100,0%
	36+	Count	0	34	34
		Expected Count	3,7	30,3	34,0
		% within age	0,0%	100,0%	100,0%
	Prefer not to answer	Count	0	2	2
		Expected Count	,2	1,8	2,0
		% within age	0,0%	100,0%	100,0%
	Under 18	Count	0	15	15
		Expected Count	1,6	13,4	15,0
		% within age	0,0%	100,0%	100,0%

gender * interest in motorsport Crosstabulation

			interest in motorsport		Total
			No	yes	
gender	Female	Count	8	2	10
		Expected Count	1,1	8,9	10,0
		% within gender	80,0%	20,0%	100,0%
	Male	Count	7	114	121
		Expected Count	13,2	107,8	121,0
		% within gender	5,8%	94,2%	100,0%
	Prefer not to say	Count	0	6	6
		Expected Count	,7	5,3	6,0
		% within gender	0,0%	100,0%	100,0%

income * interest in motorsport Crosstabulation

			interest in motorsport		Total
			No	yes	
income	0-10 000	Count	4	34	38
		Expected Count	4,2	33,8	38,0
		% within income	10,5%	89,5%	100,0%
	100 000+	Count	0	7	7
		Expected Count	,8	6,2	7,0
		% within income	0,0%	100,0%	100,0%
	11 000-50 000	Count	7	49	56
		Expected Count	6,1	49,9	56,0
		% within income	12,5%	87,5%	100,0%
	51 000-100 000	Count	1	13	14
		Expected Count	1,5	12,5	14,0
		% within income	7,1%	92,9%	100,0%

Familiarity with Sim Racing

age * sim racing awarness Crosstabulation

			sim racing awarness		Total
			no	yes	
age	18-25	Count	3	52	55
		Expected Count	2,4	52,6	55,0
		% within age	5,5%	94,5%	100,0%
	26-35	Count	3	28	31
		Expected Count	1,4	29,6	31,0
		% within age	9,7%	90,3%	100,0%
	36+	Count	0	34	34
		Expected Count	1,5	32,5	34,0
		% within age	0,0%	100,0%	100,0%
	Prefer not to answer	Count	0	2	2
		Expected Count	,1	1,9	2,0
		% within age	0,0%	100,0%	100,0%
	Under 18	Count	0	15	15
		Expected Count	,7	14,3	15,0
		% within age	0,0%	100,0%	100,0%

gender * sim racing awarness Crosstabulation

			sim racing awarness		Total
			no	yes	
gender	Female	Count	0	10	10
		Expected Count	,4	9,6	10,0
		% within gender	0,0%	100,0%	100,0%
	Male	Count	6	115	121
		Expected Count	5,3	115,7	121,0
		% within gender	5,0%	95,0%	100,0%
	Prefer not to say	Count	0	6	6
		Expected Count	,3	5,7	6,0
		% within gender	0,0%	100,0%	100,0%

income * sim racing awarness Crosstabulation

		sim racing awarness		Total
		no	yes	
income	0-10 000	Count	3	35
		Expected Count	1,7	38,0
		% within income	7,9%	92,1%
	100 000+	Count	0	7
		Expected Count	,3	7,0
		% within income	0,0%	100,0%
	11 000-50 000	Count	2	54
		Expected Count	2,5	56,0
		% within income	3,6%	96,4%
	51 000-100 000	Count	1	13
		Expected Count	,6	14,0
		% within income	7,1%	92,9%

Results for racing games or simulator experiences

age * simulator experience Crosstabulation

		simulator experience		Total
		no	yes	
age	18-25	Count	1	54
		Expected Count	2,4	55,0
		% within age	1,8%	98,2%
	26-35	Count	4	27
		Expected Count	1,4	31,0
		% within age	12,9%	87,1%
	36+	Count	1	33
		Expected Count	1,5	34,0
		% within age	2,9%	97,1%
	Prefer not to answer	Count	0	2
		Expected Count	,1	2,0
		% within age	0,0%	100,0%
	Under 18	Count	0	15
		Expected Count	,7	15,0
		% within age	0,0%	100,0%

gender * simulator experience Crosstabulation

		simulator experience		Total
		no	yes	
gender	Female	Count	4	6
		Expected Count	,4	9,6
		% within gender	40,0%	60,0%
	Male	Count	2	119
		Expected Count	5,3	115,7
		% within gender	1,7%	98,3%
	Prefer not to say	Count	0	6
		Expected Count	,3	6,0
		% within gender	0,0%	100,0%

income * simulator experience Crosstabulation

			simulator experience		Total
			no	yes	
income	0-10 000	Count	0	38	38
		Expected Count	1,7	36,3	38,0
		% within income	0,0%	100,0%	100,0%
	100 000+	Count	0	7	7
		Expected Count	,3	6,7	7,0
		% within income	0,0%	100,0%	100,0%
	11 000-50 000	Count	4	52	56
		Expected Count	2,5	53,5	56,0
		% within income	7,1%	92,9%	100,0%
	51 000-100 000	Count	1	13	14
		Expected Count	,6	13,4	14,0
		% within income	7,1%	92,9%	100,0%
	Prefer not to say	Count	1	21	22
		Expected Count	1,0	21,0	22,0
		% within income	4,5%	95,5%	100,0%

Statistics for Sim Racing events spectatorship

age * sim racing spectating Crosstabulation

			sim racing spectating		Total
			no	yes	
age	18-25	Count	18	37	55
		Expected Count	15,7	39,3	55,0
		% within age	32,7%	67,3%	100,0%
	26-35	Count	10	21	31
		Expected Count	8,8	22,2	31,0
		% within age	32,3%	67,7%	100,0%
	36+	Count	7	27	34
		Expected Count	9,7	24,3	34,0
		% within age	20,6%	79,4%	100,0%
	Prefer not to answer	Count	1	1	2
		Expected Count	,6	1,4	2,0
		% within age	50,0%	50,0%	100,0%
	Under 18	Count	3	12	15
		Expected Count	4,3	10,7	15,0
		% within age	20,0%	80,0%	100,0%

gender * sim racing spectating Crosstabulation

			sim racing spectating		Total
			no	yes	
gender	Female	Count	9	1	10
		Expected Count	2,8	7,2	10,0
		% within gender	90,0%	10,0%	100,0%
	Male	Count	26	95	121
		Expected Count	34,4	86,6	121,0
		% within gender	21,5%	78,5%	100,0%
	Prefer not to say	Count	4	2	6
		Expected Count	1,7	4,3	6,0
		% within gender	66,7%	33,3%	100,0%

use of simulator * effectiveness of simulators Cross tabulation

			effectiveness of simulators		Total
			no	yes	
use of simulator	everyday	Count	1	30	31
		Expected Count	1,4	29,6	31,0
		% within use of simulator	3,2%	96,8%	100,0%
	never	Count	3	4	7
		Expected Count	,3	6,7	7,0
		% within use of simulator	42,9%	57,1%	100,0%
	often	Count	1	15	16
		Expected Count	,7	15,3	16,0
		% within use of simulator	6,3%	93,8%	100,0%
	rarely	Count	1	13	14
		Expected Count	,6	13,4	14,0
		% within use of simulator	7,1%	92,9%	100,0%
	regularly	Count	0	47	47
		Expected Count	2,1	44,9	47,0
		% within use of simulator	0,0%	100,0%	100,0%
	sometimes	Count	0	15	15
		Expected Count	,7	14,3	15,0
		% within use of simulator	0,0%	100,0%	100,0%
	usually	Count	0	7	7
		Expected Count	,3	6,7	7,0
		% within use of simulator	0,0%	100,0%	100,0%
Total	Count		6	131	137
	Expected Count		6,0	131,0	137,0
	% within use of simulator		4,4%	95,6%	100,0%

use of simulator * opening an opportunity Cross tabulation

			opening an opportunity		Total
			no	yes	
use of simulator	everyday	Count	0	31	31
		Expected Count	2,7	28,3	31,0
		% within use of simulator	0,0%	100,0%	100,0%
	never	Count	6	1	7
		Expected Count	,6	6,4	7,0
		% within use of simulator	85,7%	14,3%	100,0%
	often	Count	0	16	16
		Expected Count	1,4	14,6	16,0
		% within use of simulator	0,0%	100,0%	100,0%
	rarely	Count	2	12	14
		Expected Count	1,2	12,8	14,0
		% within use of simulator	14,3%	85,7%	100,0%
	regularly	Count	2	45	47
		Expected Count	4,1	42,9	47,0
		% within use of simulator	4,3%	95,7%	100,0%
	sometimes	Count	2	13	15
		Expected Count	1,3	13,7	15,0
		% within use of simulator	13,3%	86,7%	100,0%
	usually	Count	0	7	7
		Expected Count	,6	6,4	7,0
		% within use of simulator	0,0%	100,0%	100,0%
Total	Count		12	125	137
	Expected Count		12,0	125,0	137,0
	% within use of simulator		8,8%	91,2%	100,0%