Perspectives from University Graduates facing A.I and Automation in Ireland.

How do Irish Higher Education's graduates from Maynooth University perceive AI is going to impact them?

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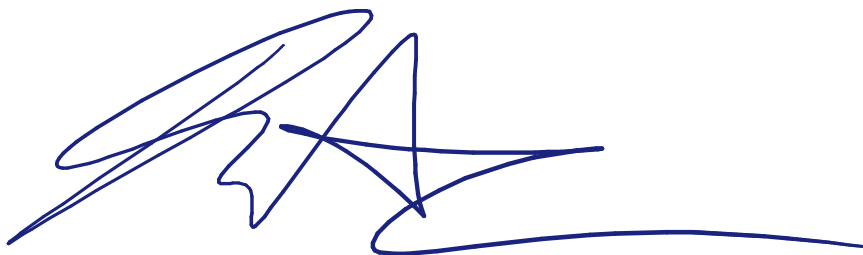14184052

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Declaration of original work

I certify that this dissertation does not, to the best of my knowledge:

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Signed

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Glossary

- CAQDAS (Computer-Assisted Qualitative Data Analysis Software) Types of software which offers digital tools to manage, extract, compare, explore, and reassemble meaningful pieces from large amounts of qualitative data in creative, flexible, yet systematic ways. (Kern 2004)

- EHEA (European Higher Education Area) is an international collaboration on higher education between 48 countries through a process called Bologna Process. Countries, institutions and stakeholders of the European area continuously adapt their higher education systems making them more compatible and strengthening their quality assurance mechanisms. For all these countries, the main goal is to increase staff and students' mobility and to facilitate employability.

- EQF (European Qualifications Framework) The EQF is an overarching framework that links the qualifications frameworks of different European countries together. It covers qualifications at all levels and in all sub-systems of education and training (general and adult education, vocational education and training as well as higher education).

- E-Skills is defined as covering three main Information and Communication Technologies (ICTs) categories: (a) ICT practitioner

skills are the capabilities required for researching, developing, designing, strategic planning, managing, producing, consulting, marketing, selling, integrating, installing, administering, maintaining, supporting and servicing ICT systems. (b) ICT user skills are the capabilities required for the effective application of ICT systems and devices by the individual. ICT users apply systems as tools in support of their own work. User skills cover the use of common software tools and of specialised tools supporting business functions within industry. At the general level, they cover 'digital literacy'; (c) e-Business skills correspond to the capabilities needed to exploit opportunities provided by ICT, notably the internet; to ensure more efficient and effective performance of different types of organisations; to explore possibilities for new ways of conducting business/administrative and organisational processes; and/or to establish new businesses' (Schmidlechner and Molinuevo 2017)

- GT (Grounded Theory) is an inductive form of qualitative research that was first introduced by Glaser and Strauss(1967). It is a research approach in which the theory is developed from the data, rather than the other way around. Data collection and analysis are consciously combined, and initial data analysis is used to shape continuing data collection.

- HEI´s (Higher Education Institutions) are institutions which teach a level of education that is provided through universities, vocational

universities, community colleges, liberal arts colleges, institutes of technology and other collegiate level institutions, such as vocational schools, trade schools and career colleges, that award academic degrees or professional certifications. In Ireland the state controlled QQI agency validates and assures these certifications.

- ICT (Information and Communication Technologies) refers to technologies that provide access to information through telecommunications. It is similar to Information Technology (IT) but focuses primarily on communication technologies. This includes the Internet, wireless networks, cell phones, and other communication mediums.(Christensson 2010)

- IPsec (Internet Protocol Security) is a secure network protocol suite that authenticates and encrypts the packets of data sent over an Internet Protocol network. It is used in virtual private networks (VPNs).

- NQF (National Qualifications Framework) The National Framework of Qualifications (NFQ) is a system of ten levels used to describe the Irish qualifications system. The NFQ is based on standards of knowledge, skill and competence and incorporates awards made for all kinds of learning, wherever it is gained.(Quality and Qualifications Ireland 2019)

- PC (Personal Computer) is a compact computer that uses a microprocessor and is designed for individual use, as by a person in an office or at home or school, for such applications as word processing, data management, financial analysis, computer games, etc.

- RPA (Robotic Process Automation) : The application of technology that allows employees in a company to configure computer software or a "robot" to capture and interpret existing applications for processing a transaction, manipulating data, triggering responses and communicating with other digital systems(Expert Group on Future Skills Need 2018)

"Computers are useless. They can only give you answers."

PABLO PICASSO

Abstract

Higher Education graduates in Ireland are being poured every year into the workforce with increasing uncertainty due to technological breakthroughs in AI and Automation technologies.

The speed of which is hard to keep up for higher education institutions due to the sheer amount of outdated and unengaging practices inside universities not translating into applicable skills in the workplaces. Qualitative semi-structured interviews are used to delve into the perspectives and attitudes of graduates from Maynooth University, a mid-size Irish university. The observed graduate perceptions range from lack of employable skills and practical knowledge plus a widespread culture of instrumental credentialism and lack of assertiveness in cases where the quality of the education is perceived as bad; to positive perspectives surrounding Universities lifestyle and flexible AI-powered ways of learning.

Through Interpretative exploratory techniques, this thesis contributes to the discussion of a more sustainable Artificial Intelligence and education system, based on the pursue of new literacies updated to the XXI century.

Key Words: Education; Work; Skills; Automation; Artificial Intelligence; Graduates Perspectives; Grounded Theory.

Introduction

> If you were to visit education as an alien and say, "What's it for, public education?" I think you'd have to conclude, if you look at the output, who really succeeds by this, who does everything they should, who gets all the brownie points, who are the winners -- I think you'd have to conclude the whole purpose of public education throughout the world is to produce university professors. Isn't it? - *Sir Ken Robinson (2006)*

Students entering in Irish universities this year will be retiring in the year 2069, and yet, no one has a clear idea of what skills they are going to need in 5 years' time. This unpredictability is fuelled by the astonishing speed in which technology is changing the nature and form of work, among other things. Now more than ever, Higher Education Institutions or HEIs are struggling to maintain a centre role as centres of transfer of research and knowledge which translate them into usable skills for their communities.

The educational model that we currently have, still relies heavily on an industrial age way of thinking (Mitra 2013). Traditionally and since the XVIII century, skills-based education has been focused on the acquisition of literacy in reading, writing and mathematics which makes up the basic competences to participate in society (Aoun 2018b; Naomi Larsson 2019). Since then, things have not changed much. Disciplines like mathematics and languages are still treated as hierarchically superior than dance and arts (Robinson 2006).

A student comes in through the door and after applying a very well thought out structured academic curriculum including certain assertive test, team projects, essays and real-world "mock" trials, exits the same door with a final "evidence"

that the student has acquired all the competences. This education system was based on the need for general populations to acquire a certain level of literacy so they could serve in the state administration, the military or the manufacturing industry(Mitra 2013).

As we enter the XX century, more and more workplaces replaced analogue machines with digital machines such as computers. A fourth type of literacy was needed to make sense of all the technological tools and mostly one tool in particular, the Personal Computer (PC). The acquisition of computer literacy came much slower and has been neglected from mandatory curricula in secondary education institutions until only recently. As workplaces have move to an increasingly digital and knowledge-based economy, it is not enough to know how to spell check a text in a word processor. Basic computer literacy is not sufficient anymore(Aoun 2018b).

The XXI Century will see the most diverse and educated workforce in the history of human kind, with numbers close to 40% of Europeans between 25 and 34 years old in possession of a tertiary education degree, and an attitude around work that sees it as individually fulfilling and meaningful to society as a whole (World Employment Confederation-Europe 2016).

This attitude of newly breed graduates will need to build on the old literacies to not only be competent, but to set the new baseline for taking part in civil society. They will need to read a new kind of language, one in the form of non-stop data streaming from various sources in diverse formats. They will need to understand and control the mechanisms of basic engineering and computer

coding. And they will need to learn how to cooperate, dialogue and communicate cross-cultural ideas and designs from a wide range of scenarios and situations across the globe (Aoun 2018b; Gow and McDonald 2006). This data literacy, technological literacy and *human* literacy will be the cornerstone of the future workforce. However, do university graduates think they are being taught these "new literacies"?

As much as I would like to be a very successful and enthusiastic sociologist, I was well advised to maintain a local scope and an attainable small group of participants focusing to not transform my post-graduate thesis into an undoable international quest for an education revolution. All revolutions have humble starts after all. In the initial moments I set off to the quest into answer a very focalised generic research question:

How do Irish Higher Education's graduates from Maynooth University perceive AI is going to impact them?

Much literature has been written around the fact that universities should adapt and focus on shaping students into professionals with critical creative skills, so they can become competent creators in a highly competitive creative economy (Aoun 2018b). There has also being extensive studies and research surrounding the prospects of the effects and possibilities that AI and Automation might have in the future of our economies and prospecting occupations. Governments and other stakeholder groups have published and committed to enhance public higher education systems meeting demands of adequate resources, funding and outreach for the next 30 years. Yet, little work has been published

examining the perceptions and the experiences of university graduates and prospecting workers in Ireland about their readiness for this future of social and economic uncertainty. Without inside information from the prospecting working population, policy making, and subsequent measures will fail to change the situation and avoid the impact of a unprecedented socio-economic crisis in Ireland and in another countries of the European Union.

All of this moulded down my prima face question that sparked the commencement of this project. After much back and forth, the prima face question developed into a 3 sub - questions that served as the research questions of the project:

1. Does Maynooth University Graduate Students perceive AI as a disruptor of their future?

2. Do they feel they have skills to make an impact in their professional lives?

3. Do they perceive that Maynooth University is doing a good job at teaching them skills?

I go into more detail on how I reached this questions in further sections bellow.

With the aim to shed some light on this discussion I devised a comparative case study focusing intensively on asking graduate students; from a variety of backgrounds and fields of study what are their views of the education they are receiving in Ireland and what are their attitudes towards the use of AI in their future works. The objective of my thesis is to discern their perceptions and

present a narrative from their experiences that can serve as a starting point for a much-needed debate around the future of how we educate. It will also seek to contribute to the discussion of developing a safe Artificial Intelligence, bringing on the table their views on how they will affect the way we learn and apply skills at work.

Review of Literature

To understand why AI and automation matter to HIE´s graduates, I set off to review the extensive academic literature, with some guiding questions in mind:

- What is the relation between technology and work?

- What are the advances that have shaped our world into a less humans, more machines ratio?

- When was the moment in which our technology surpassed our own abilities?

- Why students pursue HEI´s degrees in the first place?

- What is the impact that the aforementioned will have on HEI´s graduates?

The love-hate relationship of Technology and Work

The relationship between technology and labour has always been one of conflict and resolute to fill the gap that technology and development thus creates. This relationship has always been unbalanced as, unsurprisingly; workers are expected to resist technological development especially when is directed to make their skills less useful . In line with classical Marxist theory, those who own the means of production are the ones that draw power in a stratified society. If it does not hold truth nowadays, it did in 1811 when the newly elected British Parliament sent 12.000 men to tackle the Luddites riots

between 1811 and 1816 (Benedikt Frey and Osborne 2013). The concern of losing technological advantage in manufacturing to British competitors was big enough to warrant punishment with death for the destruction of machines and their assets. The reasons why the anti-mechanisation and tecno-phobia groups, namely the Luddites did not succeed in their objectives in Britain and Ireland was twofold: On the one hand, the newly appointed political classes were the owners of the fabrics and the assets that were spearheading this industrial revolution. Contrary groups did not have the political power to oppose them. On the other hand, the implications that mechanisation had on the society turned out to be beneficial for the many that consumed it, invent it and had low working- skills, but not for, ironically - for reasons that will become clear later, the very skilled artisans (Benedikt Frey and Osborne 2013; Bielenberg 2011).

Consequently, with the Luddites demonstrators suppressed, by the middle of the 19th century, machines and technology inventors had reshaped the economies of the majority of western societies. But more importantly, they had also shaped their education systems. In the USA, political motivation gave universities a new way of evolving, granting them huge public land grants and funding to turn themselves into skills-development centres of new knowledge. Based on the Prussian K-12 system, most colloquially known as the "factory model", universities and technical institutes began swivelling their efforts from Greek and Roman ancient knowledge to agriculture and the mechanical arts. Later to be complemented with the development of social sciences and technology research (Aoun 2018a; Hu 2017).

Development of the Mechanical Brains

The Great World Wars, that desolated Europe and muddled with the world status quo, had a profound impact in the development of military funded machinery and processes. One of these new machines developed for the war effort was "the Bombe", an upgraded version of "the Bomba kryptologiczna", a polish decipher machine. Developed by mathematicians and cypher analysts Alan Turing and Gordon Welchman essentially render the impossible task of deciphering the daily changed secret enigma code protocol used by the Axis Forcers in WWII (Turing 2012). The machine essentially bypassed the security upgrade by Nazi coders to the enigma machine, by taking less time to decode the messages than fellow human code breakers like Leslie Greer (Luke and Murtagh 2016) could do before the key was reset. This "mechanical brain" was also the inspiration for Turing after the war to keep working on his hypothetical computing device that he envisioned as a "universal" machine or namely the *Automatic Computing Engine* (ACE) (Benedikt Frey and Osborne 2013; IWM Staff 2018). Arguably known today as the forerunner of the modern computer and the start of a new trend: the paradigm switched from manual labour to automation of repetitive and tedious cognitive labour.

The machines that Turing had envisioned didn´t come into fruition until years after the war (Copeland 2018), but his hypothetical Automatic computing engine sparked multiple questions on the incipient discipline of cognitive science and artificial intelligence. Could a machine replicate the human intellect and therefore human skills? Are human brains just a complex machine

that could be imitated electronically? He envisioned a universal machine that could be tasked with anything that a human could do and achieve. Also to be undistinguishable for such human to know if the result was made by a human or by an artificial intelligent machine; something like an "imitation game". He predicted that by the year 2000, a computer "would be able to play this imitation game so well that an average interrogator will not have more than a 70% chance of making the right identification (machine or human) after five minutes of questioning." (Gregersen et al. 2018:2; Turing 2012).

The New Deal for Universities

Innovative ideas that developed during wartime sprouted a new generation of research institutes and universities that would see an infinite number of projects being financed by governments, especially in North America, European Nordic countries, the UK and France. Even when civilian projects were in the pipeline, the funding with the military and by extension the aerospace industry never ceased. During the 1960s, United States universities were receiving 73% of their research funding from the government (Aoun 2018b). The federal government of F.D. Roosevelt, because of having learned a decade prior the catastrophic consequences of not easing in the return to society of veterans of war – the so-called *Bonus Marchers* - (H.C 2010; Katz 2015), passed the Service Readjustment Act or most commonly known as the G.I Bill in 1944. Anticipating the influx of millions of highly dexterous and disciplined (they have fought a

war after all), but unskilled and untrained veterans of war into society, the U.S. congress granted them provisions of tuition, living expenses for college attendance, better conditions for houses and cars mortgages, better unemployment benefits and job counselling, among others. By 1947, almost 49% of college admissions were veterans, opening North American higher education to the working class like never in the history of the industrialized world(H.C 2010; Katz 2015).

Colleges immediately noticed that their new "customers" wanted a different, faster, commodified, business oriented-like education far from the methodical, abstract, discipline encased education they had offered until now (Aoun 2018b; Hu 2017). This influx not only created pressure in colleges but in the whole socio-economic system of the USA, creating new "community colleges"; in the efforts to allocate the high number of incoming students, focusing on getting poor but hard-working veterans a job as fast as possible (Aoun 2018b), and in a more accessible way than before.

These community colleges promoted courses in agriculture and other third sector jobs that were not required to be held in the industrialized cities, giving growth to the exodus movement to the suburbia of the cities and building the American modern-day model of suburban residential areas (H.C 2010). The model that North American universities followed, translated to the rest of the industrialized world as the cogs of a globalized economy started to shift the industrial city-centric society for a services sector focused society (Aoun 2018b; Benedikt Frey and Osborne 2013; Hu 2017).

When Clocking-in was still fashionable

The peak of the "corporate America era" turned every highly educated graduate into an army of thousands of employees that will work around the clock to provide every kind of service from financial services to dating services (Sloan Management Review Association. and Sloan School of Management. 1998). As a 1965´s quote borrowed from NASA (National Aeronautics and Space Administration) would say, "Man is the lowest-cost, 150-pound, nonlinear, all-purpose computer system which can be mass-produced by unskilled labour" (Brynjolfsson and Mcafee 2011:14).

The use of telephones, mimeo machines and more significantly the personal computer would change the face of labour forever. Throughout history, technological progress has vastly shifted the composition of employment, from agriculture and the artisan shop, passing through manufacturing and clerking, to service and management occupations (Benedikt Frey and Osborne 2013; Brynjolfsson and Mcafee 2011). Although this paradigm has always had been shifted between humans. Maybe, more importantly, these office machines reduced the cost of information processing tasks and increased the demand for the complementary factor – i.e. educated office workers (Benedikt Frey and Osborne 2013). Education was focused mainly on maintaining one step ahead of the technology and did not necessarily mean gathering more skills but rather unlocking more doors on the corporate ladder. Whereas the ability to read a handbook and a high school diploma made you qualified for operating a mechanical extrusion press and a lifetime on the factory floor; a college degree

and a MBA (Master in Business Administration) was enough to put you at the manager´s desk and into the boardroom. (Aoun 2018b; Hu 2017)

The ICT Revolution

The dotcom bubble of the 2000s and the advent of the internet changed all that. Companies like Yahoo!, Google, Microsoft, IBM or Apple started to commodify our knowledge and our information. The penetration of ICT (Information and Communication Technologies) accounted for more than 2.5% of a surge in productivity growth across the USA in the first impasses of the 1990´s, (Brynjolfsson and Mcafee 2011) propelling all sectors to acquire ICT equipment changing the landscape of working places and labour across the world (OECD 2016). In the European Union, the availability and use of ICT equipment expanded and 17 countries of the EHEA (European Higher Education Area) saw the highest average ICT value in the world, although with clear differences between higher scores in Western Europe and lowest scores in South and even more in Eastern Europe (Crowley and Doran 2019; Wit and Verhoeven 2009)

The speedy development of ICT has had a tremendous impact on the development of globalization and internationalization. In higher education institutions, for instance, because of ICT faculty mobility, recruitment of international students – notably because of the Erasmus programme - and researchers, the transfer of knowledge, and research collaboration have become much easier than it ever has before (Wit and Verhoeven 2009).

Not only that but it has made our societies interdependent and completely reliable on having access to information. This transition in which Capitalism was no longer centred on the production of material goods but on information and knowledge, was coined by European sociologist Manuel Castells, as Network Society (Anttiroiko 2015; Castells 2011)

For the first time in history, extraordinarily complex social information is managed through our traditional social networks in parts of the globe, thanks to the augmentation of micro-processing devices and the infrastructures that we put in place. Suddenly, social interactions of all kinds were not bounded by a geographical limit or a physical place (Anttiroiko 2015)(Castells 2011). The companies that were once motivated by improving productivity are now aiming for profit, which leads them to acquire and monopolise segments of society like communication, education and transport (Wit and Verhoeven 2009). Because of the instantaneously of the communications, economic and political decisions can be taken continuously with no hassle at a global scale affecting millions of people. However, even when global labour becomes more flexible and interchangeable, it is still constrained by cultures, institutions, nation-states borders and such; (Wit and Verhoeven 2009) as a clear reminder that technology is going faster than society´s pace.

The reason why human labour has prevailed to all previous technological revolutions relates to its ability to adapt and acquire new skills by means of education (Castells 1993; Wit and Verhoeven 2009), yet as computerisation enters more cognitive domains, this will become increasingly challenging

(Benedikt Frey and Osborne 2013; Brynjolfsson and Mcafee 2011). Castells argues that "what the informational economy needs is `self-programmable labour'(Castells 2011; Wit and Verhoeven 2009 :264). These autonomous, trained labourers are showing their informational capacity by leading large parts of the labour process, constantly retraining themselves, and continuously adapting to new tasks, new processes, and new sources of information, thereby analysing and solving problems creatively and in communication with others.

So what happens, when this is no longer possible? What happens when the "self-programmable labours" - understood here as "high skills workers" with life-long learning and critical experience learning – become obsolete?

To wrap our head around this idea, we have to talk about the state of advanced robotics, more specifically into the advent of Artificial Intelligence and Machine Learning Algorithms.

The Artificial Intelligences

Artificial Intelligence (AI) is a field of computer science focusing on developing systems that have "intelligence". It is a science and set of computational technologies, inspired by the human's way of using their bodies and nervous systems to sense, learn, reason, and take action. (Schmidlechner and Molinuevo 2017)

Governments and companies across the world are developing Artificial Intelligence for a variety of purposes and it is currently being used to build smart systems to collaborate effectively with people (Pouliakas 2018;

Schmidlechner and Molinuevo 2017). Although, not to the extent of what the general public might think as an actual intelligence. The current state of AI - that we know off - can be defined as a "Narrow" AI system which can carry out a very well defined structured task outstandingly well in a defined structured task (Havrda and Millership 2018).

Some examples of Narrow AI applications observed by (Schmidlechner and Molinuevo 2017:14) are:

> "Autonomous cars and trucks (wheeled vehicles that are able to operate without a human driver); unmanned aerial vehicles (flying vehicles capable of operating without a human pilot, known as drones); chatbots (Narrow AI systems designed to simulate conversation with human users); and robotic process automation (replicating the actions of a human being by interacting with the user interfaces of other software systems)".

Because of the use of machine learning algorithms, mathematical recipes that are written in code and interpreted by a virtual robot, simply called "bot", all this systems have come into fruition."(CGP Grey 2017; CPG Grey 2014). The initial development of self-learning algorithms can be referred back to Alan Turing´s ACE I mentioned previously. The modern version of Turing´s ACE is able to learn from other bots and to crawl the immense ocean of data from the internet creating new algorithms that not even their original creators understand (Copeland 2018; CPG Grey 2014; Steiner n.d.)

As (Schmidlechner and Molinuevo 2017) would define it:

"Machine learning can refer to supervised or unsupervised learning techniques. Supervised learning trains an algorithm to correctly classify a new batch of data; it is used, for example, for spam detection. Unsupervised learning is instead a method that implies the use of algorithms for pattern (rules) discovery without a direct input from the researcher, its used for example for customer purchases analysis" (Schmidlechner and Molinuevo 2017:2)

In other words, paraphrasing Michael Ford: Imagine the impact of a large corporation or government being able to train a single employee and then clone him unto an army of workers, all of whom instantly possess his knowledge and experience but, from that point on, are also capable of continuing to learn and adapt to new situations (Tritsch 2016:116)

Bots allow just that, an infinite swarm of *workers* that can perform millions of operations per second and never get tired, lazy, make mistakes or need to take annual paid leave(CGP Grey 2017; Kitchin 2017). As steam and electricity before, algorithmic power comes with disruption at every level of the socio-economic fabric although generally has also led to a betterment of living standards, significantly reducing costs and increase turnover and profit through automation and creating new services/products (Kitchin 2017) with the consequent economic growth "as people found jobs performing work that machines could not" (Aoun 2018b:18).

The good, the bad and the ugly side of automation

On the one hand, ICT and Automation technologies - in which Narrow AI is included - have boosted production, created new types of work and increased

industry and services efficiency like never in the history of humankind (Aoun 2018b). Various reports from the European Commission put automation and industrial robots as one of the reasons for the success of the automotive industry in countries like Spain, France, Sweden or Germany. According to the European Commission "47% of Spanish firms, 42% of French firms and 39% of Swiss firms used at least one industrial robot in their factories in 2012 followed by Sweden (35%) ,Ireland(32%) and Austria (32%). The lowest rate of industrial robot deployment is reported in the Netherlands (24%)" (European Commission, 2016, p. 3). According to another study by the DG COMM on a Europe wide survey, found that for three quarters (75%) of interviewees, recent ICT and automation technology innovations have a positive impact on the economy of their states, plus 67 % of them agree to have impacted positively their quality of life and 64% to have impacted positively society as whole (European Commission 2017).

Following the same study, amongst those who work (80%), agree that they are sufficiently skilled in the use of digital technologies to do their job with further 64% of all the working and non-working respondents that they benefit from the "digital and online learning opportunities" that these advances have created (European Commission 2017: 6-8). It also points out the observation that almost three quarters (73%) of those who are in the active labour population consider themselves with enough skills to use ICT and Automation technologies in a future job (European Commission 2017:8). Added to that, 53% of active workers argue that their job could not be done at all by a robot or artificial intelligence.

In contrast to 44% of them which admit it could be possible (European Commission 2017:15). Europeans are also fairly comfortable with robots doing very dangerous or hard jobs instead of humans (84%)(European Commission 2017:13), repetitive or tedious assistive tasks in their workplaces (57%) and receive packages being delivered by a drone or robot (52%) (European Commission 2017:16).

Nevertheless, on the other hand, it has also made thousands of blue and white-collar workers redundant and jobless. Even when more than 6 out of 10 Europeans have a positive view on robots and Artificial Intelligence technologies (68%), a higher number of them (72%), agree that "robots and Artificial Intelligence steal people´s jobs" (European Commission 2017:14). Some authors like the infamous highly cited study made by Frey and Osborne (2013), estimated that 47% of the jobs in the USA are highly susceptible to be replaced by automation technologies in the next 20 years (by 2033) (Benedikt Frey and Osborne 2013; Crowley and Doran 2019) and by 30% to 40% in the EU (Banga and Willem Te Velde 2018; Schmidlechner and Molinuevo 2017). Pajarinen and Rouvinen (2014) estimate the share of jobs that are susceptible to automation to be around 35% in Finland while in Germany, Brzeski and Burk (2015) estimate the share of jobs at risk of automation to be as high as 59%. Bowles (2014) finds the share of jobs that are susceptible to automation in Europe to range between 45 to more than 60%, with southern European workforces facing the highest exposure to potential automation. Others like Brynjolfsson and McAfee (2014) or Bessen (2016) are equally pessimistic but

argue the change will come more gradually in a more extended timeframe (Pouliakas 2018; Schmidlechner and Molinuevo 2017). Other hypotheses like the ones from Manyika et al (2017) who supports the idea of a very long transition period in which regulations and the differences between occupations can delay the full inception of automation until well entered the 2050's. (Schmidlechner and Molinuevo 2017)

The Celtic Automated Tiger

This also holds true in Ireland. Doyle and Jacobs (2018) observed the "destructive power of automation" through conversion of 2 famous methodological frames, one by Benedikt Frey and Osborne (2013) and the other one made by Nedelkoska and Quintini (2018), which point out that even though their impossibility to compare the occupations and sectorial codes due to methodological and estimation differences, they can identify the trends across sectors from both models reaching the following conclusions (Doyle and Jacobs 2018):

Occupations in *Transportation Storage, Agriculture, forestry and fishing; Wholesale and retail, Administrative & support services;* and *Construction* sectors accounting for more than 26.8% of the employment in Ireland are at the highest risk or with a significant risk of automation with "a 48.3% for the F&O method versus 44.9% for the N&Q method (...)", pointing out the small difference of 3.4 percentage points (Doyle and Jacobs 2018: 27). These results are in line

with those found by a more geographically-focused study by regions and small rural towns made by Crowley and Doran (2019) where:

> The areas expected (in the theoretical and empirical literature) to be the most resilient to automation are in the fields of education, legal and community services, the arts, media, healthcare, computers, engineering and science and the types of jobs at high risk are jobs in office and administrative support, low skilled services, transportation and sales related industries such as telemarketers, waiters, barmen, taxi drivers, accountants, tax preparation and jobs in retail (Crowley and Doran 2019).

This is especially acute in predominantly rural regions, like the South-East and the Border regions. Regions that already suffer from ´brain drain' (Arntz, Gregory, and Zierahn 2016; OECD 2016) plus the 2008 recession effects were more prominent leaving labour markets relatively weaker and in a less capable position to offer alternative opportunities to workers should significant automation of jobs occur (Doyle and Jacobs 2018). *Agriculture, forestry and fishing*, being a sector which plays a big part in these regions, could be affected by automation up to 85,3% of the available jobs (Doyle and Jacobs 2018).

They also note that employment in sectors with a high risk of automation is declining whereas employment is increasing in sectors with low risk. They suggest that this could be an early symptom of economic structural change that potentially could diminish exposure to automation and the subsequent disruption of the labour market (Doyle and Jacobs 2018). After all, the last figures from the CSO (Central Statistics Office) of the Republic of Ireland show the employment rate in Ireland has increased by 0,8%, reaching 69,1% over the

last quarter of 2018 (Q4), whereas the employment rate in the EU-28 in the same period was 68,9% (CSO 2019).

Flexiworkers and Platforms

What we can extract from the empirical and theoretical literature is that there is a consensus around the research community that automation technologies *are happening* and will definitely impact the socio-economic structure of western European countries, like Ireland, in some way or another. What is also clear is that the unpredictability of this impact needs to be addressed by our formal education systems to address the irrevocable change in our society (Aoun 2018b).

Most of the 2008 effects we can already see in the new forms of labour that have been custom since the end of 2008 Economic Crisis. Well-educated and trained workers (self-employable labour) became necessary for the functioning of new automation technologies, and less-skilled workers (generic labour) were threatened with dismissal. With the arrival of more and more Narrow-AI development, new kinds of companies based on algorithm-powered services spun out in the form of "platforms". In the words of Dutch sociologist José Van Djick,

> A platform is a programmable architecture designed to organize interactions between users (…) which is fuelled by data, automated and organized through algorithms and interfaces, formalized through ownership relations driven by business models, and governed through user agreements"(van Dijck, Poell, and de Waal 2018: 3).

On the one hand, platforms create a type of work where the worker can only follow the prescribed procedures of the work that has to be done thanks to their efficient algorithmic managerial staff (CGP Grey 2017; Wood et al. 2019). On the other hand, it creates, more than before, the possibility for non-standard forms of employment and part-time work because a large number of complicated actions can be performed by these algorithmic managers (van Dijck 2018b; Wood et al. 2019). With such conditions, a new group of *flexiworkers* (Brown, Phillip. Keep 2018) has been created. This "Just in Time Workforce" is commonly known as *gig-workers*, part of the Gig-economy (van Dijck et al. 2018; Stefano 2016; Wood et al. 2019).

The Gig economy makes reference to the use of networked platforms (van Dijck 2018b) for working remotely or locally. Companies make use of platforms to realise transactions of services, with their workers being mainly "freelancers" and being managed by the algorithm manager, which puts them into contact with a client. The algorithm creates a flexible competitive environment in which workers must bid for the task propose proposed by a client, creating a very well organised and efficient workflow that can be adequate to the worker (van Dijck 2018b). It is known among policy makers of "lower and middle-income countries" that the push and subsequent growth of gig work has made comparably more successes than other more developed countries, especially in remote gig work (Stefano 2016; Wood et al. 2019).

This however, does come with its downsides. The balance between stress and security can sometimes be hard to manage, as workers are under constant

scrutiny through invasive control methods (screen grabs, frequency of clicks) (van Dijck 2018b) and the reputation and rating systems of the algorithmic-managed platform(Wood et al. 2019).

The intrinsic part of the gig economy is that it rest on high-skilled individuals who can offer a certain set of skills through a platform, based on the ability to adapt to different demands and circumstances on a "just in time" basis (Facer and Selwyn 2005). This new kind of *super-employees* (Havrda and Millership 2018) are expected to have flexible enough skills when developing their working practices anywhere in the world, making the clocking-in from 9 to 5 in a specific location model completely obsolete (Facer and Selwyn 2005).

Consequently, some authors argue that education models around the world are struggling to overcome the "individual´s education factory cycle" model designed more than 300 years ago (Mitra 2013). The system is designed to feed the *administrative bureaucratic machine* of the late empires of the 18th century by giving students the ability to read, handwrite documents and make math operations in their heads by later integrating them as an integral civil servant in any point of the administration of the empire (Mitra 2013). These 3 skills are still considered the pillars of education literacy that are above all other subjects in every other formal education system in the world (Aoun 2018b; Robinson 2006).

The way forward for Higher Education

Educational innovation has made great advances in the last couple of years (Aoun 2018b; Hu 2017) to accommodate this new situation as individuals are expected to learn different skills and competences from a variety of ways, regardless of their prior education, skills or age. This has also prompted a variety of mediums in which this education is engaged, either through formal educational institutions, remote learning or learning from non-formal or informal environments (Anon n.d.; Facer and Selwyn 2005; Halford and Savage 2010).

However, higher education is not setting the bar anymore for how far you can climb the corporate´s positions ladder, but rather is dividing the workers that have (and can afford) a life-long learning experience of specialized skills programme and those who don´t (Aoun 2018b; Wit and Verhoeven 2009). The acquisition of competences and skills from formal educational systems is key to bridging the so-called *digital divide*. But whereas some techno-utopian actors like to think that the capitalist competitive market will eventually lead to the *full* penetration of ICTs (Facer and Selwyn 2005); with some prominent projects of global satellite constellations of internet coverage like Airbus´s OneWeb or SpaceX´s Starlink; clashes with a majority of authors who observe the issue as one of unequal uses of ICTs rather than unequal access to ICTs (van Dijk 2005; Facer and Selwyn 2005). Any student in the world can learn how to use ICTs without the help of a formal education system, like shown by the Hole-in-the-

Wall experiments carried out by Sugata Mitra (2003) in 1999 India, postulating the following hypothesis:

> If given appropriate access, connectivity and content, groups of children can learn to operate and use computers and the Internet to achieve a specified set of the objectives of primary education, with none or minimal intervention from adults .(Mitra 2003, 2013)

It is up to the students to then use those e-skills and engage in a particular working practice (Mitra 2013). Formal education attainment and the future spread of ICTs will help this goal , it is clear we can extract from most of the literature that ICTs access is found to be influenced by socio-demographic factors such as income, education, gender and age primarily (van Dijck 2018a; Szeles 2018).

A recent report by the European Centre for the Development of Vocational Training (CEDEFOP) calculated that automation technologies have certainly influenced the employment patterns in the EU but to varying degrees in different economic sectors and on different education-attained skills groups. (Pouliakas 2018)

Employment will decline in agriculture, fishery, manufacturing, and also for clerks' jobs which are low-skills. This analysis hence reveals that the median EU employee faces a 51% probability of being in a job that may be automated. Following F&O's approach, it is found that about 14% of EU adult employees have jobs that face a very high risk of automation (i.e. the median automation probability exceeds 70%). Similarly, 40% have a non-trivial chance of

automation (between 50 and 70%), while for 34% of workers the automation probability ranges between 30-50%" (Pouliakas 2018:18)

The studies which have been carried out in Ireland also show this trend with a study conducted by (Crowley and Doran 2019) in Irish towns with populations with more than 1.500 people. They found that pretty much all of the 200 surveyed towns *are* in high or in a significant risk of automation thus some places being more impacted than others. They conclude that towns with a population of fewer than 5.000 people and greater than 10.000 people are less exposed to automation due to various spatial and socio-economic factors like lack of critical 'working' mass, rural areas/towns not being inside city regions, etc. They also argue that towns with a higher proportion of third-level graduates are less susceptible to automation, because:

> It would be expected that places endowed with a greater proportion of educated workers are more likely to create and attract more highly skilled businesses and jobs that will be less exposed to automation. This is complimented by a greater proportion of creative occupations also significantly reducing automation exposure (Crowley and Doran 2019: 22)

The study also points out the critical role of universities in the successful urban and especially rural development by being more accessible to peripheral communities where the "brain drain" (Arntz et al. 2016; Crowley and Doran 2019) is more acute, and unlocking local skills and competencies by "making skills development and education more financially accessible and remotely possible"(Crowley and Doran 2019: 26).

According to Wit and Verhoeven (2009), universities will still play an important role in the training of high-skill workers who will develop managerial and professional jobs. They also predict that if they want to stay ahead of the curve, more universities will have to merge into networks that support "lecturers, students, managers, researchers, governors, and other stakeholders not only for building networks but also for the evaluation of the work of lecturers and researcher", in other words, transnational spaces of education like the EHEA (Wit and Verhoeven 2009). Networks based on programs and policies that support "learning-by-doing" and interdisciplinary skills add more social and emotional skills apart from digital skills into the curricula(Crowley and Doran 2019; Havrda and Millership 2018) like the Erasmus Mundus master's programme ought to be the norm (Aoun 2018b; Gurukkal 2018).

Establishing digital hubs of learning around the *glocal* urban and rural areas of the world could make the acquisition of new skills potentially better. Especially in the Irish context, these hubs could be supported by nearby regional universities who feed on locals that can act in rural areas and unlock untapped potential creating new hubs of learning (Crowley and Doran 2019; Havrda and Millership 2018).

A new curricula for these new "learning hubs" could be based on an already proposed curricula by Joseph Aoun (2018) which, as many other authors (Crowley and Doran 2019; Havrda and Millership 2018; Robinson 2006; Tritsch 2016; Wit and Verhoeven 2009), concur that a better understanding of what humans can do and what we cannot do in comparison with an AI, ergo

dedicating more time to elaborate a curricula that could fit those skills(Havrda and Millership 2018)

Aoun (2018) Humanic´s new types of literacy proposes to focus on learning 3 new literacies on top of the already well established traditional 300 years old literacies (Mitra 2013)

- A technological literacy which will be based on the understanding of mathematics, coding and basic engineering principles.

- A data literacy which will make data analysis as easy as English class, which purpose is to give the tools to read digital records and also understand when we ought to look elsewhere (Aoun 2018b).

- And a Human literacy, to equip us with the social milieu, giving students the power to communicate effectively and engage with others in a sustainable way, tapping into our human capacity for grace and beauty. The proposed will encompass most of the liberal arts and especially design.

According to (Aoun 2018b) these new literacies are not enough on their own and they need to learn 4 cognitive capabilities, namely Critical Thinking, Systems Thinking, Entrepreneurship and Cultural Agility:

- Critical thinking allowing humans to observe, analyse and communicate in a contextual and imaginative way. Current Narrow AI technologies are particularly good in observing, analysing and producing but they lack the synthesis and imagination capabilities of human workers.

- Systems thinking is the understanding of complex elements inside of systems. This allows workers to *think outside the box* and engage problem-solving from different angles and different disciplines. For example, the invention of floating buildings by European architect Koen Olthuis spared through not only the scope of an architect, but an anti-climate change environmentalist, a designer, a material scientist, etc.

- Entrepreneurship will allow for graduates and students to think beyond the old jobs we currently are replacing with technology and apply concepts and skills that can innovate in fields that have been yet unexplored. This also will transmit the concepts of learning from failure that machines lack.

- Cultural Agility is crucial for problem-solving across borders. Humanity has conquered every corner of the planet and expand its cultural differences at the same time. Even when phenomenon's like Globalisation are bridging most of the gaps by allowing international trade and global workers, understanding the cultural context of a village in India or one town in Ireland is an ability that still differentiates us from intelligent machines.

What about the Graduate Students?

Yet, what do students and subsequent graduates think of all this? Surely, they are the ones spending money, resources and their time to *achieve* a formal education degree. Why do students pursue HEI´s degrees in the first place?

Graduates presume that the competence and skills that HEI´s curricula offer are increasing their human capital level and capabilities, while at the same time, are placing them in a vantage position over non-graduates in the labour market (OECD 2016; Tomlinson 2008a). This also includes graduates who do not have a clear idea of what skills they are acquiring, therefore reinforcing the argument that HEI´s degree qualifications are "primarily pursued because of their perceived positional value and advantages in providing access to employment" (Tomlinson 2008 :53). 32% of Graduates who did took part in upskilling courses, financed by the Irish Higher Education Authority since 2011, admitted that they had received an advantage once they went on to look for a job (Higher Education Authority 2016). But according to Tomlinson (2008b), even though graduates welcome the democratisation of higher education and the equal accessibility to HEI´s, there is a crescent fear of over-saturation of graduate students in the western labour market with the subsequent rough competition between similar qualified graduates.

This phenomenon is also fed by the seemingly normal practices of employees of asking for further levels of formal education qualifications, fostering the *academic inflation* that has been created. This has also reached a point in which

academic certifications are not as valuable as other soft skills that can be acquired not necessarily through formal higher education methods but through other personal experiences and non-formal and informal learning experiences, or with the use of online platforms for e-learning (van Dijck 2018a; Tomlinson 2008a).

The Department of Education & Skills' "current projections for the next twenty years show that demand will rise steadily to approximately 65,000 in 2025, peaking at almost 68,000 in 2027, followed by a slight fall-off to 64,000 in 2030"(Department of Education and Skills 2011 :44) and yet they admit that "it will require resolution of a number of features of a funding system that, to date, has undermined Ireland's performance in lifelong learning"(Department of Education and Skills 2011 :114).

In spite the efforts by the EU Directorate-General of Education and the Department of Education and Skills of the government of Ireland on developing upskill and re-skill courses in platforms, like Springboard+.ie, Ireland still lacks a flexible system of university admissions and a proper life-long learning program (Department of Education and Skills 2011) that is sustainable enough to achieve the objectives set out by their own Innovation Taskforce.

This might explain why a recent study by Gallup and Northeastern University (2019) showed that 58% of UK and 65% of Canadian respondents answer "Cost" as the reason "why traditional 4-year universities are not the best equipped to provide career-long education and retraining". The same study also points out that 45% of UK, 57% of the USA and 47% of Canadian respondents believe that

HEI´s degrees are always outpaced by the workplace changing needs (Gallup and Northeastern University 2019:35). And this lack of up-to-date technological knowledge is what might make 38% of UK, 48% of Canadian and only 22% of United States respondents believe that HEI´s are preparing students for future jobs involving technology well (Gallup and Northeastern University 2019).

The review of the literature served me as a guidance for revising and calibrating my research questions and what is more important, focusing on the gaps that could contribute to a future debate on these topics. I describe the process of reaching and calibrating my questions and the methods I used to answer them in the following section.

Methodology

We have established, based on the literature surrounding this issue, that some sort of disruption in the way we learn, and we work *will* happen, mainly on the grounds of technological and artificially intelligent technology breakthroughs.

We have also established, in line with most of the literature, that HEI´s are still relevant for the foreseeable future in regards to transfer of knowledge and training new highly skilled workers. The literature shows, that there are innumerable ways in which HEI´s and formal education can still be useful and relevant in the knowledge society.

There are authors affirming that graduates have different levels of awareness of the advantages and disadvantages of Artificial Intelligence-powered technologies but more often than not, they are not aware of its capabilities and the processes that this technology can develop. This correlates with other studies made about the general labour force in the USA, Canada and the UK in which paradoxically, they show optimism about AI bringing developments to society as a whole(Aoun 2018a) but they worry about the job loss that this will have in general(Aoun 2018a; Gallup and Northeastern University 2019).

This alone, could be considered an immense amount of research for which the scope and range on this thesis falls way short. Therefore, I will focus my efforts on understanding the concrete concerns of students of a highly socially, economically developed and well-educated workforce as is the Republic of Ireland.

Revised research questions

The initial curiosity I had orbited around the efforts of understanding **how these breakthroughs could impact recent Irish graduate students that are about to enter the labour force with a diverse range of skills and methods acquired through higher education.** With a clearer picture of the established consensus surrounding AI and it´s possible effects on education and work, I set off and wrote down 3 prima face questions. In other words, turning my curiosities into questions of the top of my head:

1. What is the state of automation in work with relation to Narrow AI?

2. What are the strategies put in place by the universities to respond to automation?

3. What is going to be the impact of AI in the present and future HEIs graduate employment opportunities?

While these questions set the tone of the project, they turn out to be too broad and too impractical. With the help of a storyboard, I visually spaced the topics I had encountered during my literature review and I immediately observed a common pattern orbiting 3 main central storylines or themes:
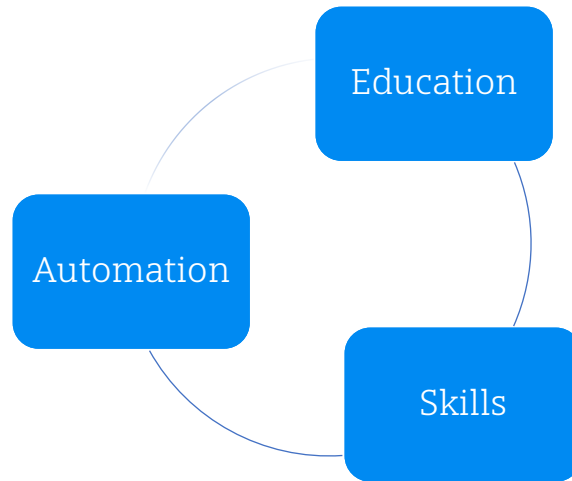
Figure 1 The central themes of my thesis in a pattern Source: Own Work

.

This cyclical pattern represented the relation and the interaction between the Higher Education systems, the transfer of skills and the Automation of work. At the same time, I stumble upon a more real operationalisation issue: the scale of the inquiries and the feasibility of such effort in the limited timeframe I had. Which lead me to a more centralised and accessible research question:

How do Irish Higher Education's graduates from Maynooth University perceive AI is going to impact them?

Soon enough, after the review of the literature, the probing of some secondary research data and the advice of my supervisor, it was clear that such a vague question wouldn´t be enough. Therefore, I redraw my research question into 3 more detailed sub-questions that would serve my research better into finding the efforts mentioned above. Finally, I ended up with these 3 research questions:

1. Do Maynooth University Graduate Students perceive AI as a disruptor of their future?

2. Do they feel they have skills to make an impact in their professional lives?

3. Do they perceive that Maynooth University is doing a good job of teaching them skills?

As with my research questions, my aims, my objectives and more importantly my scope changed during the progression of the project. In the next section, I describe the aforementioned and how I went about to decide on which methods to use for conducting my research.

Aims, Objectives and Scope

The aim was to established a narrative from which we could explore the context in which graduates are immersed and connect the views of graduates with the *reality* of their situations (Thomas 2017).

In considering an inquiry into this topic, I was faced with 2 alternatives about the nature of this study. One is that I could have made assumptions about the world that we live in, considering this divisible and quantifiable elements and factors that I could measure and manipulate using quantitative methods. However, by rejecting the validity of these ontological assumptions in which such divisions are based, I could see that the social world in which I focused my lens, is fluid and incomprehensibly quantifiable, with a rainbow of interpretations constructed collectively by individuals - similar with the result of a light beam when shot through a prism.

The thesis will attempt to bridge the gap between what the literature and multitude of studies estimate about the (sometimes dystopian) forecasts of automation of jobs by AI around the world and the perception current graduates of a *low automation risk Irish town* have about it. Building an exploratory narrative will require a qualitative approach in which we can extract and interpret their perceptions and views towards their perceived anxiety or optimism or whatever other flavour of perception around this matter. In this way, we would understand what their perceptions about the skills curricula that an Irish National University is transmitting, and how is that translating into the actual advantage or not at the time of entering the workforce. Understandably, I am hoping that by using this method, not only graduates will offer their views in their particular situations but will also offer a glance to the general structural issues that relate to them, if any.

Research Methods

I proposed to carry out a case study consisting of 15 qualitative semi-structured interviews, with the aim of capturing the participant perceptions, feelings, ideas and underlying patterns relating to AI, skills and their expectations of work from graduate students or just-graduated students - those with an NQF level 8 and above or EQF level 6 and above – that had receive education from Maynooth University. Maynooth University is a relatively middle size university located in Maynooth, Co. Kildare, a town which is spatially categorised by Crowley and Doran (2019) as a *low automation risk town.* The acknowledgment

of this detail proved useful in the perception of the social reality in which these graduates are immerse.

Graduate students are an integral part of a broader system as it is the university, with a range of different individual situations and elements. The use of the case study framework in which information is extracted from subjects and compare it with other elements embroidered without a particular period of time allowed me to extract a great of information through the lens of our subjects, in this case graduate students. In other words, a multiple diachronic nested, case study of Maynooth University graduate students – see Figure 2
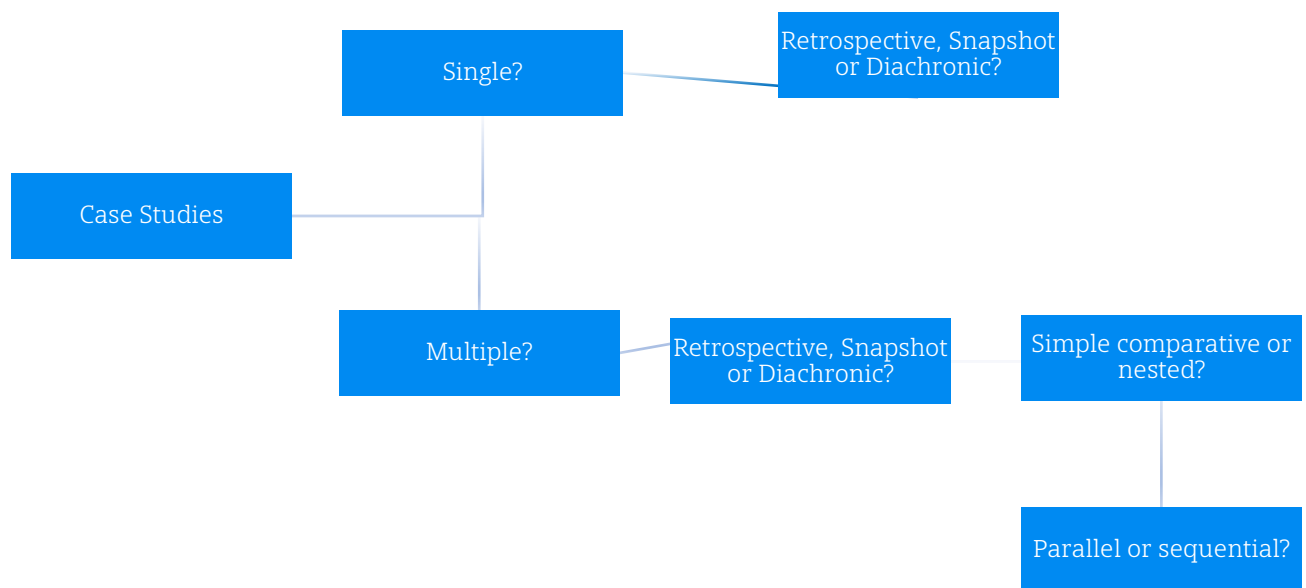
Figure 2 Choices in undertaking single or multiple case studies. Source: Thomas, G. (2017)

With a population of around 2,160 post-graduate students - 1,800 Masters students (Taught & Research) and 360 Doctoral Students, according to their

latest census 2016/2017- in more than 125 disciplines (Graduate Studies Office 2019), is well enough diverse to have a comprehensive narrative of the population in a well stratified sample.

Considering the fact, I am one of those 2,160 post-graduate students, interpreting their narratives would be an easier process than from an outsider perspective in the analysis stage and in the gathering of participants as well. The objective was to get insights from 15 graduate students through non-probabilistic purposive

snowball sampling method, diversified based on my own stratified sampling design.

The stratification of the sample- see Table 1 - was done under my own criteria and knowledge of access to specific participants in diverse disciplines and their availability as some prospecting participants would most probably have restrictive working schedules. The contact to participants was mainly done by direct contact or social media/ messaging app.

The stratified sample design was as follow:

Are they currently working?	
Working	5 (n)
Not – Working	5(n)

In which education stage are they?	
Postea Post-Grad	8 (n)
Post-Grad	6 (n)
Undergrad	1 (n)

Table 1 Stratified Sample Source: Own Work

Which field of study?	
Social Sciences	3 (n)
Humanities	3 (n)
Natural Sciences	3 (n)
Formal Sciences	3 (n)
Applied Sciences	3 (n)

Is worth remembering that this study was designed with the size of the sample not to be a sign of the quality of the study as this was based on an interpretative and exploratory methodological framework. The study did not set out to check hypotheses or theories but intended to generate theory grounded in the data.

As the object of study was very specific but not wanting to hinder the flexibility to probe and explore specific points the participant through to be important, a semi-structured interview was devised as the instrument to carry on the research. The use of a Semi-structured interview allowed me to cover all the topics for exploring an answer to your research question without hampering

the possibility to explore any other topic or matter that the respondent deemed necessary or important for the questions.

I drew up an interview schedule- see Table 2 which served me, the interviewer, as a guide for the main list of issues I wanted to cover while at the same time allowing for exploring and probing in another areas or questions, that is, encouragements to drawn out a particular point made by the respondent. The interview schedule was designed with the research questions in mind and the 3 main themes of this study – see Figure 1

Semi-Structured Interview Schedule

Table 2 Interview Schedule Source: Own Work

Issue/theme	Possible Questions	Possible Follow-up Questions	Probes
Education and Work Life	Can you tell me about your education in general since you graduated from secondary school?	What field of study you think you are in? And what about your qualifications? What about outside of university? What motivated you to go to university? What do you think about your lecturers?	Is it the field that you wanted? Have they served you? Can you elaborate a bit more on that?
Perception of Education and Skills	Do you think [Maynooth University] has prepared you well to be successful in the jobs of the future? What about in term of skills? Can you tell me about the skills that you think you have acquired at Maynooth University? Do you think you will need to upskill?	Do you feel that the education you have acquired at [Maynooth] has given you the necessary skills to achieve the job that you want? Do you think that [Universities] are still relevant?	Was it worth it? And in your opinion?
		How did [Maynooth] offer these skills? Do you think your skills will be obsolete? What will be the things you are missing from your degree?	Would you come back to University? Is it something you think about a lot? Oh, Really?
Expectations and career development	Can you tell me little bit about your work plans? What type of work are you hoping to get in the future?	You think you have the skills need it for that job?	How is that going? How do you feel about that?

Attitudes towards AI	During your education here in [Maynooth], was there any mention to Automation, Artificial Intelligence or the future situation of the job market?	Have you ever considered the possibility that an AI replacing you? Do you know what AI can be used for?	Can you tell me more? Did/Didn't they? What did/didn´t they say? How you would describe your attitude towards that?

The interviews, averaging 45 minutes each, were electronically recorded using a digital audio recorder device and stored in a safe encrypted hard disk location as well as a backup copy in a private cloud server located inside the jurisdiction of the European Union (EU). The audio files were later transcribed using *Transcribe by Wreally* automatic transcription narrow AI powered software as well as manually with open source transcription software *oTranscribe.* This allowed me to transcribe the entirety of the interviews. The software was capable of automatically process the audio file creating a text file with timestamps inserted every 15 seconds, making an automatic separation between clearly distinct speakers and marking them as such. Although the software was capable of producing a very accurate string of text with interpretation of sounds, like *ahms* and *uhms*, proper nouns and punctuation, it was far from perfect. It was still required to listen to all of the recordings to do various corrections: Correction of colloquialisms and proper nouns, adding and fixing punctuation to improve readability and contextual meaning of what the interviewee wanted to say, non-verbal communication ques, verbatim wording of certain quotes, correct wording of disfluencies or self-interruptions

between words, correct identification of speakers as often the software could not differentiate them correctly and most importantly, anonymization of the sensitive and identifiable material from the interview. A manual revision of the transcripts was done using the assistive player of the software and applying the conventions of transcribing notation set up by Hsiung (2010) in her guide to qualitative interviewing "Lives and Legacies". This revision was carried out for each of the interviews and any personal or directly/ indirectly identifiable information was taken out or replaced by a bogus.

A semi-structure interview allowed for a more ordered data collection in which certain aspects of the interview will be retained to be thematically associated or disassociated accordingly, making the construction of a thematic narrative less appalling. Thanks to this, I could transcribed 12 interviews out of the 15 interviews as 3 participants withdraw their consent – see Table 3   were later analysed and coded using the Computer-Assisted Qualitative Data Analysis Software (CAQDAS) ATLAS.ti. Using a CAQDAS allowed me to analyse and constantly compare the transcripts in an ordered way, organising them by interpretative inductive inquiries.

Table 3 Interviewees by their Field of Study

	Interview Name	Field of Study	Risk of Automation(according to Crowley (2019)
1	Ceren	Engineering	Medium Risk
2	Cian	Psychology	Low Risk
3	Conor	Psychology	Low Risk
4	Dave	Law	Low Risk
5	Diarmaid	Law/History/ Political Sciences	Medium Risk
6	Donnager	Computer Science	High Risk
7	Ellen	Teaching/ Communication/ Sociology	Medium Risk
8	Kevin	Engineering	Medium Risk
9	Karina	Journalism/ Communication	High Risk
10	Peter	International Development/Policy	Low Risk
11	Sara	International Relations	Low Risk
12	Willem	International Development/ Computer Science	Low Risk
13	Participant withdraw	-	-
14	Participant withdraw	-	-
15	Participant Withdraw	-	-

The stages of the analysis I followed were according to the coding techniques coined in Grounded theory (GT), namely Open Coding, Axial coding and Selective coding. This set of very specific terminology is named differently across different CAQDAS and constant comparative method stages of qualitative analysis, however, they generally follow the same processes (Thomas 2017):

1. First, *open coding* usually serves as the initial reading through the data and is where the researcher highlights the "temporary constructs" or

important parts of the data and assigns them to categories that are identified from the data.

2. Second *axial* or *theoretical coding* involves categorising and making sense of the previously done open coding, attaching labels to the codes, usually regarded as "second-order constructs".

3. Third and final, *selective* coding carries on after the labelling of the codes, this is the part were usually themes are drawn out, making associations and relationships between the constructs. In my research it was also accompanied by a themed map I explain below. Ideally, a situation of theoretical saturation is attained where no new categories or properties emerge from the gathering of further data.

Prior to the open coding stage, a pre-set list of codes for each of the main topics was created – see Table 4 and then extended it with new codes as the analysis of the text carried on. This follows Miles and Huberman method which creates a provisional "start list" of codes prior to fieldwork, based on the conceptual framework, the research questions, hypothesis and problem or key areas that I am bringing with my research (Basit 2003) – see Figure 3.

This pre-set list of codes was:

Thesis Central Theme	Code	Explanation
Education	Formal Education	Education provided in a formal traditional 3-year degree by a HEI like a University, a Technical Institute, etc.
	Non-Formal Education	Education provided outside of the traditional format institutions, usually through Vocational training, volunteering, etc.
	Online Education	Education provided fully or partially through a self-learning digital platform.
	HEI´s (Higher Education Institutions)	
Skills	Education-acquired skills	Skills acquired through education system
	Experience-acquired skills	Skills acquired through personal or general work experience.
	Digital or E-skills	Skills related to digital literacies (Technology and Data literacy)
	"Soft" Skills	Skills related to cognitive human skills (Critical thinking, Cultural agility, social interaction skills, etc.)
Automation	Gig- Work	Work procured by a algorithmic managed platform, and the underlying economy.
	Assisted AI work	Tasks which are done assisted by an AI powered technology.

	Replaced by AI	Tasks which used to be done by a person, now done through a AI powered technology (e.g. platform)
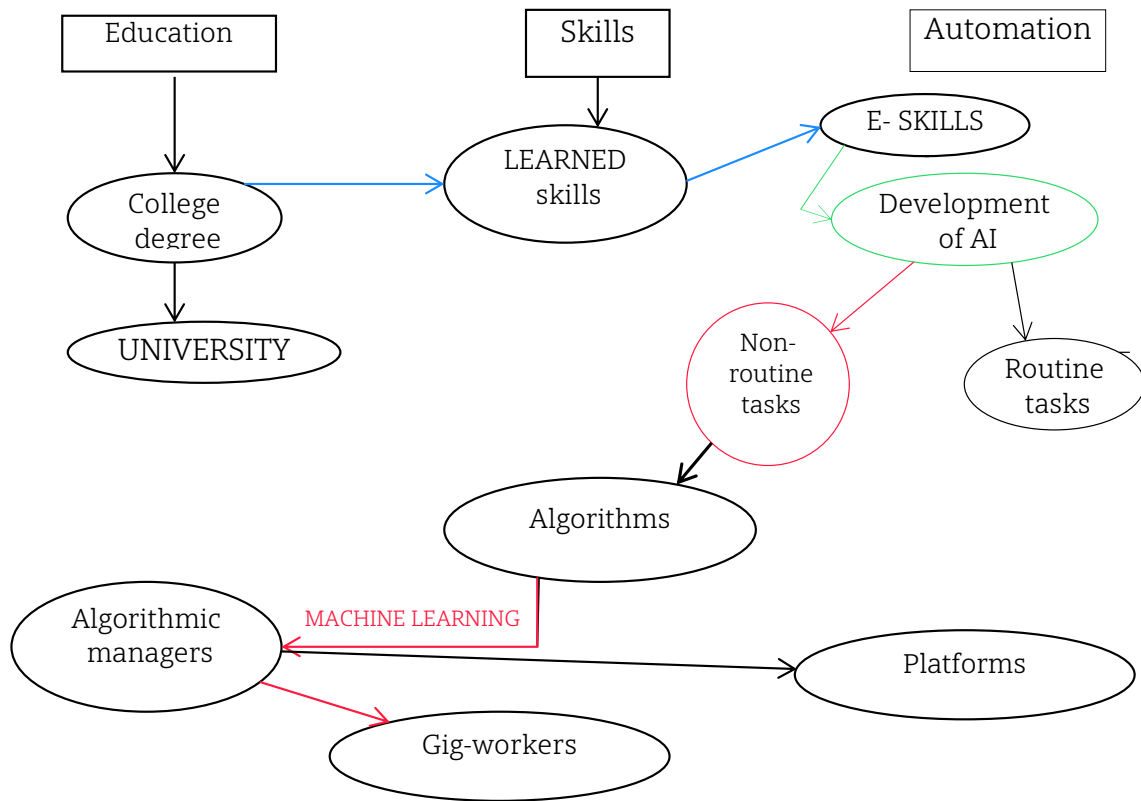
Figure 4 Original mind map of the topics of the thesis Source: Own Work

Following the grounded theory techniques, I read through all the data, highlighting and saving quotes that could have a useful meaning for later stages of coding as well as using the pre-set list to categorise them in an early phase. Using the "quote explorer" from the CAQDAS, I isolated every highlighted construct and attached a code label to it, either from the pre-set list or creating a new one. When reached the selective coding stage, I started the process of

drawing the themes out of the narratives, aiding me in the process, the use of a technique called Theme Mapping- see Figure 6. By creating a map of the highlighted quotes of the interview and putting them in a chronological order, I could have a visual representation or mini-map of the interview where those quotes were illustrating the prevalent themes, even stressing those themes in the quotes boxes. After adding all relevant quotes, I connected them with 2 kind of lines: Dotted lines for ideas that were connected between themes, and solid lines with an arrow if I wanted to point out that "the theme which the arrow is pointing out to seemed to be explain the theme were the arrow is originating from"(Thomas 2017).

At the same time, I isolated certain quotes that could be used to illustrate the issues and perceptions of those themes commenting on the context of those and building a narrative that the reader could reckon with and understand following Bliss, Monk and Ogborn (1983) strategies "which are commonly used for analysing these data, namely to report results in terms of a relatively simple category scheme, or to put before the reader by extensive, though necessarily selective, quotation the data themselves, hoping thus that the essential flavour comes through"(Basit 2003:146)." In my study, I used a combination of both. Drawing from the data I categorise some of the responses according to their perceptions of how AI technologies are going to affect them. Borrowing from (Nam 2019), I categorized their views about technological development in regards with socio-economic outcomes and split them into a bi-dimensional table:

		Predicting undesirable outcomes	
		Less	More
Predicting desirable outcomes	More	**Optimistic**	**Mixed**
	Less	**Skeptical**	**Pessimistic**

Ethical Considerations

My thesis ethical considerations were considered as "low risk due to the fact I was not going to deal with sensitive topics or groups. Nevertheless, the study adhere to the maximum standards of ethical and regulatory research scientific practices, always in concordance with the law and in respect of United Nations Human Rights Charter, the Ethical Guidelines lay down by the Sociological Association of Ireland and the European General Data Protection Regulation specifically on the following areas quoted from the ethical guidelines of the Sociological Association of Ireland (Sociological Assocation of Ireland, 2018): Professional competence, Integrity, Respect for human rights, diversity, and equality and social responsibility.

Digital privacy is a paramount concern, especially in this study as a portion of the main part of the research was carried out in a digital setting and as such, I followed the European General Data Personal Regulation in regards of the gathering of demographic information and data such as sex, gender, ethnic background, political ideology, age, civil status, etc. or any other identifiable information, anonymizing it as required.

According to Article 9(2)(j) in which allows a researcher to process sensitive data where "processing is necessary for [research] purposes in accordance with Article 89(1) based on Union or Member State law which shall be proportionate to the aim pursued, respect the essence of the right to data protection. As the research was carried out primarily in the Republic of Ireland, I also adhered to the Irish Data Commissioner guidelines on how to present the consent forms – see Appendix A the subjects and how to correctly anonymize the data in question:

> "Article 5(1)(e) of the GDPR requires that personal data not be kept in a form which permits identification of individuals for any longer than is necessary for the purposes for which the personal data are processed. The wording 'in a form which permits identification' refers to the possibility of retaining data which has been fully anonymised.
>
> Article 5(1)(e) also sets out that personal data may be stored for longer periods insofar as the personal data will be processed solely for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes in accordance with Article 89(1) subject to implementation of the appropriate technical and organisational measures in order to safeguard the rights and freedoms of individual." (Ireland Data Protection Commision , 2018)

Discussion of findings

Let's briefly pause and invite one more time to the stage, who are the central characters in my convoluted and plot twisting play. The nexus between Education, our way to learn, that ultimately leads to gather skills, our application of knowledge to advance our socio-economic life that, at the same time is affected by our obsession to make those applications ultra-efficient and completely automated, affecting at the same time the way we learn and the way we gather skills making this relationships a fully and infinite loop…. – see Figure 1

The plot thickened when, with this cycle in mind, I started wondering why no one is doing anything about this situation, or put it in a more accurate wording, why we don't perceive that nothing is being done. That was the main seed of the project, the crystallization of the quest to understand. How on earth are we not doing anything about the impending rise of more-than-human intelligent capable technologies that the vast majority of authors including Arntz et al. 2016; Benedikt Frey and Osborne 2013; Crowley and Doran 2019; Doyle and Jacobs 2018; Rafael Reif 2019; Schmidlechner and Molinuevo 2017; Tritsch 2016) predict it will radically disrupt the fabric of our society to the core. Wouldn´t be a case of the general workforce of the future to be tremendously worried about this? I am.

Perceptions towards AI

Maybe it is a matter of understanding AI? As mentioned in the literature, most of the students interviewed claim they are not very acclimated with the consequences and possibilities that AI currently offering or future possibilities. This could explain the whole "we are not doing anything because there is nothing to worry about" statement. However, the first theme I discern emerging from the data was of familiarity with the concept of AI or "computers that can think" as computer science student Donnager puts it:

> Donnager: Well yeah, like you can you can tell the computer to do anything... It's just-- Like okay, This is weird....(pause): Computers can think, they can , we can we can teach computers to think really simple thoughts now, really simple things. The more complex the thought this Suddenly It's you know, exponentially [crosstalk]

> Interviewer: don't be afraid to go into terminology...

> Donnager: Ah no sure..... but you know how it works. There's it gets exponentially more; you need more processing power. Yeah, eventually, will will will go mad scientist enough and we will create [01:08:23] something that is thinking on its own level it's thinking on a relatively complex level. – *Donnager, S/He.*

This familiarity with the capabilities and possibilities of AI takes different shapes and forms from the more technical and metaphysical ones to the more every-day and tribal cases with various degrees of worriedness, scepticism and optimism from different field backgrounds.

From my review of the literature, I could see that every second article or journal warned against the undesirable outcomes of the development of general AI and the dystopian effects on the workforce and society as a whole. Something this master's in law student shared in relation to his own practice as a lawyer:

> Because each case has its own unique perspective and I do not think AI is developed to that extent as of now, okay in its current form maybe in the future. It may be good...I think that will posed a threat to humankind.
>
> (Why do you think so?)
>
> It would not only take away jobs and employment, but it would render people more useless. It would render people more useless and it would lessen the scope of human beings, too. Be employed on their own capacity to make money in general and if you take off the Humane element in adjudicating cases. People definitely need to a lot of mistrials. – *Dave, He/His*

This other communication and marketing student, shared concerns about a not so distant future in which she expresses concerns for facets of our life's. This are already changing because of the perceive uncontrolled "nature" of technology, worrying that developing AI with the same amount of careless will be catastrophic, expressing that " [AI] it´s not going to be balanced once it´s already there":

> I'm a bit scared of that. Because I don't know a lot and I know it's actually in the back. It's like growing really fast and there is a lot of people really working in that there is already a lot of robots that look like a person actually and yeah and I think in a lot of not in my job or in the in the subjects that I'm interested, but I think All the aspects of our life are changing because of technology and it's true that in another kind of jobs.

It's gonna be devastating for a lot of people because we will never need a person again to do it and it's somehow it's going to be better because there is some physical works that are really bad for the body but machines are not going to be affected for that. But of course, there's a lot of people that will not be able to work in the topics that probably are the ones that you don't need studies in so yeah, I don't know how we're gonna make it to. To make it possible because it's not going to be balanced once once it's already there.

Another concern was closer to our familiarity. The students expresses concern about the fact that more computer scientist are writing AI programmes to do their own very mundane and repetitive tasks. As well as signaling the increased numbers of students in the field and the growing sense amongst themselves that they had to 'do all they could' to attain a positional advantage in the labour market:

I follow a lot of like programming humor pages, but they always share this one guy's work and like they all share it, like "oh this guy's doomsayer is hilarious. Hahaha." But he is a lecturer at MIT. Okay? and he's been talking about it for years— have complexity of CS jobs is getting less and less complex and they're getting more and more specialized because we're able to write AI programs to do some mundane stuff to troubleshoot very mundane issues. So there are more people studying CS today than there ever have been before and yet we're getting better and better at automating CS unless you're becoming more and more specialized. He is not wrong. He's not wrong. So that's a worry me.

The reason for this pessimism and fear of AI and robots could not be better expressed by this journalism student:

Interviewer: Why is that? Scary? Well, why you think is scary?

Karina: Cause' they're robots man....(laughs) ....Have you ever seen *I Robot* the movie? One bad robot... [crosstalk] (laughs)

However, not all is pessimism and doomsday sentiment funded by the very entertaining popular culture and media. Most of the students I interviewed see Artificial Intelligence as an assisting technology that can help them develop their occupations better, more efficiently and safer as well. They express views with skepticism that an AI will completely take over their most skilled and cognitive jobs for a very good reason expressed by this student:

Interviewer: Why you think is scary?

Conor: Well.... have you seen Terminator? (laughs)

Interviewer: (laughs) I think I have.. yeah...

Conor: Yeah, so that that would be very similar fact case

Interviewer: So so even-- so you think that even if we kinda like it if the if the AI or technology assist us, hmm, it will be [crosstalk]

Conor: ...much much much better than-- I think if it's assists us it will be much better than it taking over so but it has to assist us ...-- it has to be smart in how it assist us. So if it's assisting our communication or if it was assisting you know, our day-to-day life standards, is too much. Because that's what humans do, whereas if it's assisting something that we can't do or we could do what makes it faster then maybe that's just....

This scepticism is also fuelled by very rational thinking that a machine will never be able to conduct themselves the same way that a human would do, even if it is a question of courtesy over the phone:

> Oh yeah sure, even when I was there like people like literally this job could be done by a Machine. (Okay.) So like, it's just a courtesy to have people do it, because people are more likely to respond to an actual live person on the other end of the phone, I think. Rather than a robot and yeah like it's of course the I think they have people doing it more so...

The most interesting themes taken from the data where those students to explicitly said they were trying to specialize themselves to neglect or diminish the effects of automatization in their occupations:

> Personally. I feel like I have to be specialized in something that can't really be automated completely to be subject to human design, which is why I got actually really enjoy UX, UI design just kind of like, okay. I can play around with this. I can present things with this. This is this is something I can do a lot of work with but can't necessarily be automated completely because it solves it human Flair to it.

That "human flair" is what most of the students see as their principal reason for being sceptical about AI. The capabilities and skills they develop with human experience or the context of a conversation cannot be, in their views, replaced:

> Yeah well, you know, anything that involves communication I think is it cannot AI replaced but any standard kind of parts of the job or [00:38:19] career definitely come so even those generic skills like being on time and organized , sure the AI could do that. Nobody. No robot could do that easily and but I think [00:38:34] speaking to a robot is-- it doesn't have the same effect. So I think there's certain parts of --or qualities you get, when you're working that can't be replaced. [00:38:49] That's why it's probably just

better to have humans. And I mean unless they want to make me half robot where I show up on time and I'm organized all the times (laughs) I don't need to pee. You know....(Do you think there's a possibility?) (laughs) [00:39:04]..... robot nappies. Yeah. Yeah, but it's possible....where it does the timekeeping and the organizer for me and I just do the Being Human bit. That's quite scary to think of so, I'd rather....

Altogether, the themes that kept coming up in the interviews is one of common scepticisms with some regards about the worries of a distant future , very develop AI technology. The most prominent theme was about optimism towards the possibilities that AI can bring to nowadays works and it's importance in revolutionise all of the aspects of our lives. In their views, AI is helping in realising and assisting tasks that were regarded as time-consuming, frustrating or plain and simple "pain in the ass". For putting a couple of in vivo examples, this law student describes how AI assistant search engines made the research for previous cases exponentially efficient and universal accessible as the capabilities for searching for every law case in the world could be done with the "click of a button". He is careful to point out, though that the humane element of the judiciary will still need to be there:

There are many different areas of law. Like that is the peak podesta that I'm talking about the Judiciary but there are many other areas of law which can which are being dealt with in terms of AI , like for example developing like when I practice law there are search engines like Westlaw or Supreme Court cases, these search engines are developed by artificial intelligence. They have an element of it not totally but they have an element here which contains records of All Case Files and Care decisions. That would

be relevant to the cause of action you're dealing with so it's a, it's a It's a forum where with a click of a button you can you have access to all the case law in the world now previously traditionally people used to go through millions of books to do that, which would be very time-consuming and often lead to frustrations. Now that doesn't happen. So automation has its role in these and making courts go entirely paperless and to extents roles of lawyers can be taken up by automation, but not judges. Because like just present a case and to present the case in its initial stages. It may be possible to use a machine in that respect. And then after it goes into trial then you need to get a real lawyer. Okay. I said the human element required. So I've decided case for that human element in it. That's the thing.

Other cases have advanced and unlock academic research that a couple years ago was seen as science fiction. The recreation of realistic environments, the use of AI analytical tools and more importantly, the simulation of conscience could create a forward leap in the all fields of research, as this psychology graduate explains:

Yes is [inaudible] It's on the rise now with the old artificial intelligence stuff, you know, because we were able to simulate environments that otherwise would cost a fortune to come up with in a lab. So when you have AI´s or AR stuff are starting our granted reality and you can create a scenario that it's very hard to create or very expensive to create in the lab and and also even simulation of stuff. (Is it as big as well?) So you know the-- for well my field, like navigation and walking. It's a lot easier to get 30 people in and have them do a virtual logging test than have 30 people in tandem and make them walk through the woods and was very time-consuming. So that's another benefit. And as far as actual AI is concerned then things like neural modelling and stuff like that. It's going that way and and that stuff that we can't do, unfortunate. So there's only a certain amount we can probe at the brain. So I think if an AI can predict or model while one

might happen if we were to delve further or develop something more that's really helpful. I think definitely say it is going that way.

This views and attitudes not only extend to repetitive, managerial tasks or previously impossible simulations but surprisingly and conflicting with my previous hypothesis, they also see with some kind of o sceptical optimism with the assisting roles in creative and buoying cognitive fields like design, music production or direct communication. This student talks about the possibility that backend web developers will be out of the job in favour of AI that can understand what a designer wants and code the website in the background:

And some of the skills that I've learned will be redundant. It's like why do I need to know HTML or CSS when I literally just talk to a bot and say I would like this with this kind of color, with a small gradient coming from this angle and it's just doing it all in front of me because that's not even me, that's not even a Machine really learning, that's just a machine understanding what I'm saying and writing the code and then predicting how that should interact. It's very small simple automatable tasks that you wouldn't need much more than a modern desktop to do if you had significant sufficient voice recognition software. At that point it's not really the machine knowing to think this it's more so it is relating what you're saying and breaking down the information into okay, so it's excellent. Yeah, it's basically just building from what you've said. And once you can automate a machine to that level, I think most people in web development drop out of the job...

This student also talks about the technology revolution in fields like music production with the advent of digital mixers and AI algorithms that modulate and mix millions of instruments in an never seen fashion:

Well, I'm a musician and I have seen in music there is a place that technology is making music change like crazy, but for me, it's in a good way, I have learned that. And it was not it was recently like I knew it from before that me thinking about it. It was reasonably there is a couple of guys that they're doing amazing music and with these systems of looping these looping and disc jockey tables that we have now, if you are a matching with 1 million instruments, you can be better than a band because you can have everything, you can play all the instruments kind of at the same time, you know, so I saw a video today about this these two guys jamming. It's a really famous song [Tadow]... that jamming, they're doing it in the studio at the same time down there filming and now it's a really famous song but a lot of people doesn't know it's improvised and and they play all of the instruments and they sing and they are just two persons.

As previously mentioned, the more sceptical views are regarding in fields where you are expecting human interaction, customer-service and related. Although, in views of this student, it will be very helpful if it could assist with the generic tasks that apply to every single field or non- "human bit":

Yeah well, you know, anything that involves communication I think is it cannot AI replaced but any standard kind of parts of the job or career definitely come so even those generic skills like being on time and organized , sure the AI could do that. Nobody. No robot could do that easily and but I think speaking to a robot is-- it doesn't have the same effect. So I think there's certain parts of --or qualities you get, when you're working that can't be replaced. That's why it's probably just better to have humans. And I mean unless they want to make me half robot where I show up on time and I'm organized all the times (laughs) I don't need to pee. You know....(Do you think there's a possibility?) (laughs) ... [yeah with] robot nappies. Yeah. Yeah, but it's possible....where it does the timekeeping and the organizer for me and I just do the Being Human bit. That's quite scary to think of so, I'd rather....

The issue of transfer of skills and qualities from HEI´s to the workplace is another of the main reflection points I inquiry during my fieldwork. And precisely, the qualities and skills that you get from a degree or not , shape this understanding.

Empowerment and Feedback Systems: Conformists & Hackers

A dominant theme that kept popping up was the perception that their degrees haven´t give them a single employable skill after a 4-year traditional degree, with often a truly clear objective in mind whereas this is a career path or a field of study. Instead, I find 2 beams of perceptions from within the whole array of the spectrum. At first glance, they might seem conflicting flows but overall, I could associate a common theme between them. On one end we have the students who *conform* with the system like it is, they seem to understand the way it works and the means to get their objectives going along with the reasoning that qualifications are an instrument to "get the foot in the door" or pass the filter requirement of a particular job interviewing process. A case referred in the literature as instrumental credentialism (Tomlinson 2008a), as expressed by this psychology master student:

> Like I'm paying for this degree that I can put on my CV and say "look, I have a master's" even though for me personally saying I have a master's doesn't have any, it doesn't have any legitimacy to it because I don't feel like I have learned or I don't feel like I've learned more so much more than I had before entered the Masters to be able to feel like I'm way more skilled and ready for the workforce. It's just the actual physical degree and what

the fact that I can put that on my CV is way more valuable than the education itself. – *Cian, He/His.*

The subjacent narrative is that they would like a more applicable degree - which does not necessarily mean specialized - so they can feel legitimate to say "I have learned something" when they finish their studies. But, when ask asked about "what are the roadblocks" they are often said they are "stuck" in compulsory modules that they don´t offer them any particular skills apart from being a way to gain their qualification. They seem to understand that this modules are supposed to serve as foundations for their general fields of study and they refer to the great freedom they have in choosing whatever modules they pleased to fit their career prospects, signalling the 2 weeks prorogue that Maynooth University offers to every student to test different modules before registrations are officially closed.

However, when talked about generic compulsory modules they show hesitation and feelings of frustration and unfairness in general, even if they are happily working in their preferred fields as I perceive from these master´s students:

> It is to extend to this like a gained a lot of new initiatives about the-- before I go into this. I'd like to say that., The course is very well-tailored and like students are welcome to tailor it. So yes, the modules are very specific to certain causes. Some are more generalized, and some are more specific, and students have the freedom to choose whatever module they require. They feel like would suit them best at third their career prospects and everything. So in that regard, I would say that students get two weeks' time to attend the respective modules and just see and just to get a flavour of what it offers. So in that way is really well structured and there's no flaw in the course because

it depends on the student because they have access to every module that they want. But maybe certain [00:11:49] modules cannot be made compulsory. Like for example, (hesitating) – *Dave, He/His*

Yeah, I do I would love for psych-- I think ideally psychology as an undergrad would be more specialized. So for instance my masters or the Masters that were available to me when I was looking at Masters were just off the top of my head, you know counselling and Psychotherapy, applied psychology, which is psychology in an applicable setting and within that Branch there was a master's in mental health, which is what I'm doing or organ. sports and organizational or motivation, all those things and I think it would be better if the undergrad level was specified to that degree because I knew when I was going into my undergrads that I wanted to work in the health care setting and so if I could have spent part of those four years upscaling directly within that field and I think most people do know what they want to get out of there undergrads, but unfortunately, we all end up having to go through the same undergrad and I know that there are benefits to that because I am aware now of, you know, not so much from my undergrad like specific Theory or Notice I said but more just a way of thinking but still I think it's just it's it's unfair to a certain degree to ask people to do an under for your undergrad in Psychology. And then at the end of the day, they don't have a single employable skill... So yeah, at the end of it, you know? – *Cian, He/His.*

Yep. I was actually think that was probably the worst part of that was because everything we were doing I knew that I wouldn't be using anyway. [Because next year I'd be going to psychology so I wouldn't actually need so I was learning a lot of Stuff I wasn't interested in that I wouldn't even need as I went on. So that was that was a real motivator I suppose because I think if I had to continue on with computer science for say three years, then I'd want to know how to do these things. You know what I mean?, where is the new the fact that I didn't actually have to do any of them. – *Conor, He/His*

This inflexibility or lack of freedom motivated this student to seek another course and navigate within the established structures of the university. He seemed to have a very clear idea of what field he is interested and in what he wanted to work in, but turned to be overwhelmed by the sheer amount of specific science related modules that he needed it to take in order to pass to the next year. He ended up making use of the his course year coordinator to address his problem and directed him in a more positive perceive path:

> I knew it me while I am just you know, the kind thing you just know that you don't want it was on those. So we just knew this wasn't for me and it was incredibly overwhelming experience and wasn't what , I imagined it would have been and particularly liked not doing psychology first year or survive, but their first year is very delicate from for most people and they're not [00:07:32] doing what you think. Your you want to do in your first year is kind of his very scary. So so then I emailed the BSc coordinator and said look, "I'm really don't think this is what I want to do [00:07:47] and is there any options available to me?" I One day he kind of took me into a ro-- to his office and had a chat and suggested that it might be possible to change and be nice if you could change [00:08:02], obviously they're needed want to well, no wonder it was wondering why I did I wanted to switch and again, that's just sometimes you just know it's not what you want to do. And yeah, and he dragged me through the admissions office and admissions sort it out..[00:08:18] So it was it was a very laid back friendly approach to who has a serious problem with both.. – *Conor, He/His*

The support he received by a university professor was enough to find a new course in gaining his qualifications and not falling out with his own educational decisions. This group also displays an acceptance that the system is teaching

them a "way of thinking" regarding their field of study or discipline… Interesting enough this theme associates strongly with disciplines with a projected lower risk of automation, namely Law and Psychology. This acceptance doesn´t mean that they are not critical with the education system and they often show a clear vision on how to improve the current system. They seem to suggest that shortcomings can be solve by novel solutions or by putting already working solutions elsewhere and apply them locally like for example, attaching a counsellor to every student who wishes to pursue a career in an specific department :

> Yes, so skills that would be required for a future employee purpose. Most of these are covered by and modules that are offered. Like I said before it's a very terrible course, so the course can be tailored to your own specifications based on the modules that you want to choose and so the burden lies beyond the student the student can talk to the lectures and get an idea. They get two weeks time to check each module as to how well they fit in. So how well it fits in their overall criteria. But when I feel is that Counselling Service could be attached to this course to every course basically, so that students have the opportunity to access a counselling service because There are many modules that are offered. It can be confusing. It is. I face this dilemma, but from my years of experience. I knew what I wanted to do. So it helped me progress in a better way, but I do believe it can be confusing with so many modules as electives. So what can be done is when it was suggested that mean person would be to introduce a counselling service with the students can have get to have a professional from the Department who may have experienced who can counsel the students with regards to what module they can choose or perhaps Would go in line with their career preferences or for what they want at that time being – *Dave, he/his*

I could also asses the practical limitations that students are faced either because their HEI´s are underfunded or because their professors lack up to date teaching procedures. In this case, a communication student was frustrated with the lack of technological skills training for a well-known field full of necessary digital and technological skills like is journalism:

> That I think in my university was a lack of Technology, you know, in some house in some way because some career is a degree as I said before they need already more technology because it's already in the professional world. So you cannot arrive to the professional world and and the know that that was existing already and it's like that, we are getting out of University and we wouldn't we don't know that part. – Karina she/her

In general, this group of students represented a dominant concern among the general discussions of the educational community that was shown in the literature: lack of assertiveness and the subsequent deficit of empowerment over their decisions.

On the other end we have what I like to call, the *hackers* of the system. Those who are still inclined to go through a traditional 4-year degree but they are seem to have a hard time accepting the structure and end up engaging in ways to overpassed, twist it or basically hack it. The best way to describe it is through the ingenious activities that the classmates of Donnager went through to pass their modules:

> "So this is why like you can see the degrees of CS students and who's going places. So there's a few students who had this system and they gave each other the answers [00:49:14] and the bot had to be fed the answers and it would click the area of the screen for a certain amount of time and then it would swap to the next area. All right? So, there's

only two zones is like ABABBAB. It was like (clicking noises) right-- it will click that, and they timed well enough [00:49:29] that it would do it accurately. So, like you didn't have to listen to the video. Much better fit! The much much better version, (laughs) the much much better version has an automated web scraper that when the video opened, scraped the HTML [00:49:44] to find where the the insertion for those questions was, found which one was the correct answer and just checked it when it showed up. (laughs) That was the better one... that one like...that person's going places!! (laughs)" – *Donnager, s/he*

The common theme around these students was similar to the *conformist* ones in the sense that they wanted to gain a qualification, but they generally seemed to have a more assertive attitude towards negative attitudes of the professors (modern name for lecturer) and structures in general. What I found is that they do engage in the systems of feedback from the university but often they feel that are useless and they don´t achieve anything. A theme which keep surfacing was about the attempts by students who enter the formal traditional 4-year or 3-year degree "subverting" the system and basically ending up hacking the education system". Later pointing out that:

> Well yeah, the lengths that people have gone to in CS to do some arbitrary bullshit like that. Students love to feel like they're getting away with something. Yeah, of course, it's, that should be a real teaching tool in my mind and ..
>
> - *Donnager, S/He*

I found that this perception by Donnager that students like to "feel like they are getting away with something" is a perfect summary of the existing gap between the expectations of the skills' learning experience and how they end up

completely disheartened from those experiences in their preferred fields leading to find workarounds to those experiences when their professors don´t reach their expected mark:

> That's my point of like there are incredibly creative students, but they are qualified practices, bad teaching practices and people who, frankly, I don't think should be lecturing at the level they are lecturing. That's not saying that they shouldn't be lecturers or shouldn't be teachers. I'm just saying that the level they are at, I don't think it's acceptable to not allow your students to ask you questions. I'm paying thousands of Euro to be here and to be sitting the lecture and be told that "Yep, you are allowed to ask questions any pointers raise your hand or just ask it out whatever depending on the different lecturer then teaching style. That's fine." But then to have lectures who either blank your questions or just say, "It's in the book". Yeah. That's that's it's really disheartening because it's like 'well, I have to go and research it' like "yeah sure that's your time [00:52:59] investment", but it's an extra time investment for something that they could have very easily, done it by you. – Donnager, S/He

When asked why was their experience been so negative even when they feel like s/he loves that field of study, s/he concluded rather furious:

> I don't know. I don't know (covering face with hands) this is this is this is an issue like this... This is this is not just an it's an issue with every year. I had this issue this year with two lectures two of them just hated teaching and you could tell they hated teaching their classes, but they they're here because they're getting paid to be here and they're like, (mocking voice) "Well, I like my subject and I like people who like my subject" but if you have a question about their subject and it doesn't line up, it's not: "Oh, let me answer that question, It's "Go read the fucking book and get out of my hair". – *Donnager, s/he*

The frustration of lack of empowerment is amplified by the opinions about other classmates and colleges having a culture of "don´t really give feedback" or self-indulgence, sum up into:

> Cause bleeding people don't give feedback on their lectures and because that, because that culture is there of like you don't really give feedback on your lectures, lecturers are allowed to do shit things, really shit things are allowed to have shit behaviour. They're allowed to be shit teachers who know a lot about the topic but don't know how to teach.
> – *Donnager, S/he.*

Another crucial factor, drawn up from the data is the perceive failure of the feedback systems that the University have in place. Not so much about the actual system itself and how is design with the various student representatives called academic *reps* meeting and discussing issues in Academic Councils with members of staff, but the effectivity and the often lengthy bureaucratic process itself that ends up receiving results way too late in the academic semester. When ask about a follow up on how they managed the situation, this was the response:

> It's just by the time that we actually managed to get a meeting arranged for the head of the department. It was starter the middle of-- no it the second week in November. Which is only like the sixth week of term here. But by then there was only about two, three weeks really left because it was two weeks of new material and that was just revision. So, it didn't really matter, by the time we hit revision, what his attitude was because most people don't attend lectures during that period. -*Donnager, S/he*

Such views were echoed by an engineer student who went through a similar case raising concerns about the lack of technical hands-on experience on his

degree and submitted an anonymous feedback form, a typical feedback system employed by the University:

> Kevin: That's definitely actually-- I'm thinking about that. Yeah. I know. ehmm I'm it's very theoretical and we'd got very little hands-on experience with electronics, you know? I did science design in first year. But I felt I didn't have the experience do it in a correct manner. I kind of had to do it myself and... ahmmm.... that was actually one thing I actually did complain to them. But I (Really?) Yeah, I written my member ehmmm, There's feedback letter and I remember of one of the first things I put on it was-- and I was doing electronics and I actually never did any practical work. I don't think I see I think. I did not.... maybe one class but it wasn't it was very low level entry level stuff where like if you want to be Electronic Engineer, you need to get into real complex and you know, the real, ehmmm I guess, the harder stuff you can say ....and that was I definitely-- get them feedback on that and..... And yeah, that was yeah that was once I thought was very theoretical.

> Interviewer: Did they answer the feedback?

> Kevin: No. No... It was conducted at the end of the term though. Yeah, it's my first year and it was just at the end so I did and I didn't put my name on it anyway. So yeah they couldn't have been able to contact me for that. I did definitely mention that and I said -- you should be able to specialize at a much earlier stage so there's more time for you to go into your specific field, but that you know that that comes with its stains because some-- a lot of people don't know but I feel like it's very hard to push it all on the final year, especially electrical because there's just so much material to cover in the year.

With such instrumental concerns, I started seeking for associations between more themes of lack of assertiveness of students plus lack of pedagogical

engagement from professors and the use of AI platforms to workaround those disheartened experiences. All of the interviewees have resorted to some form of self-learning platform or e-learning. The lack of engagement and the outdated teaching styles were the dominant themes when compared with the use of AI powered learning platforms, like Brilliant, Skillshare or just classical video tutorials from YouTube:

> YouTube has been the greatest learning aid in my entire life because most lectures, to their credit try, and really try. And in first year I had this fantastic lecturer who really tried, made the lectures more interactive and fun; the book we had was actually quite fine. It was very basic but it's good to get everyone into the basics. I had already known some of the basics so It was good for revision…..We had another lecture. It was also quite good, and we had another lecture who just kind of didn't really….. ……. didn't really-- (pause) the best way I can say it is they're teaching is dated, their teaching style was dated… - *Donnager, S/he*

Reaching that level of actually willing to replace the professors by a self-learning platform that can give them an adequate learning experience:

> So what I envisage in the future is a lot more self-learning platforms and universities providing platforms that are self-learning with less lecturers [00:47:29] who are there but more pre-recorded things and then maybe an hour a week where there's a lecturer…

This groups of *conformist* and *hackers* are by no means, a stark separation of university students but rather 2 of the multiple representations that can appear in a wide spectrum. Rather interesting was the convergent theme that both reached about the nature of university undergraduate degrees:

You know, you're always come back to learning. Like I'm I've always seen it like this the skills I'm learning in this undergraduate are not the skills I'm going to be using in ten years. The skills I'm learning in this undergraduate are how to learn skills. – *Donnager, S/He*

[...] we all end up having to go through the same undergrad and I know that there are benefits to that because I am aware now of, you know, not so much from my undergrad like specific Theory or Notice I said but more just a way of thinking, but still I think it's just it's it's unfair to a certain degree to ask people to do an under for your undergrad in Psychology. And then at the end of the day, they don't have a single employable skill... So yeah, at the end of it, you know? – Cian, He/His

This brought out a deeper discussion about the role of universities and their perceive role in society. Are they centred in teaching employable skills and life-long learning or they are centred into giving a foundation, a way of thinking and "the skills to learn how to learn skills"?

The role and ideology behind universities

The students I interviewed often referred to the role that the university has in terms of fulfilling a paper in society. This was highlighted by universities being portrayed as the turning point into someone's life, as usually is the first time they move away from their parents and start to live independently:

Yeah, I guess I'll go away. Yeah, so go ahead guess who's my first break from my parents? So it was really, you know, kind of a Growing Experience for myself, you know, there's obviously some good things that happen and there's some bad things but and always it's real vibrant place every degree to Good Times there. It's a good craic and you know,

I bought the out bad times as well there but overall experience I feel as positive and I feel like I've grown a lot with the [00:06:25] place, I guess. – *Kevin, He/His*

Moreover, is also the first time that are able to experience study abroad programs like Erasmus+ programme, the J-1 Visa programme and learn soft skills which they regard as valuable and encouraging:

So then I like teaching and I was like, okay, this is actually really cool. You know, I get [00:26:01] to like be an international environment really get to know people like get to help people on a personal level like I wanted but rather than being like a vulnerable population they were I was it was more people who are trying to better themselves and Empower themselves. So that was really encouraging to work with people that were really self-motivated rather than these kinds of teenage kids that could care less that I was there. (laughs) – *Ellen, She/Her*

That was just so there is the the J-1 Visa which is a cultural exchange Visa. So it's not for any other reason than to according to what the Visas specific purposes is to just experience a different culture to learn some things and then take them home and be able to implement them in your home country. So that was the the purpose of which was to just it wasn't for money or for a job or it was just for a cultural experience. – *Cian, He/Him.*

Other themes regarding the paper of the universities also resonated with the original role that universities were placed to carry out. Centres where critical thinking on every discipline but have fall into the disguise of a factory of workers. Regarding this issue, this student shares this reflection:

Universities should be about a critical thinking in all sorts of different areas, Whatever area is he in what on some level that they have just turned into, "well, let's have this course that means that you can get this job". And I'm one at always been on some level

of thinking where it's like there's a course that you can do to become a primary school teacher that's a degree can do and then you go to your primary school teacher and that's what happens and I think this is something that the government are looking to in specific areas and they're looking to develop a specific source of aims which still isn't necessarily serve because I mean even if looking from a technological perspective you want to make somebody if you want a student to do a course that produces a worker who can work for a tech industry, then how are you going to be able to write them in skills that you know, we're going to be relevant for the long term, you know?, because I mean that industry changes so often that they are whatever they learn could be entirely relevant in five years or as if you learn on an ideological base, that's always going to be relevant. Yeah, how can it not be? – *Diarmaid, He/His.*

In light of this reflections, I could discern that the current experience of learning skills, the role that universities play in our ever-expanding competitive workforce market and the way they are being transferred to the workforce were associated . In synthesis, the majority of interviewees were motivated in one way or another to go to university because they wanted to continue the common traditional educational progression with the intent to get a desired occupation while learning exploring and learning their facets. They seem to perceive it as a way to unlock the next level in the qualifications ladder and achieve their desired skills.

The future of university learning

In the case of these students, they didn´t progress through the traditional education path but they followed a more utilitarian approach. Working or

acquiring real life experiences that then would be enhanced or instrumentalised by the pursuing of a degree or an exploration in a field of study.

In the case of this particular student, he portrayed something similar to what Sumatra Mitra observed when he did his Hole-in-Wall experiments back in 1999 India. He learned how to programme taking screenshots from a well-known American TV Show called "24". A better account of his story in vivo:

Willem: I feel I felt we learn every day from the environment from the people with meet, from the things we see like from,-- for me I had learned a lot from watching movies. I don't just watch movies for movies sake or for the shooting sake. From every movie I always take something out of it.

Interviewer: Ok....Like being in the sense of like the story or like the way they're doing [crosstalk]

Willem: Not the story, the way they are doing certain things... (OK...)

Willem: You can! If I tell you... have you watched 24? The season....

Interviewer: Ehmmmm the tv show?

Willem: Yeah is series that was they had to Stop 24 hours or something. Yeah with the policeman. Yeah. Yeah, Jack Bauer. Yeah. I tell you I learned how to program from that.

Interviewer: No way.... (laughs)

Willem: Yeah (laughs), so that actually learn from that...

Interviewer: I don't believe you...

Willem: I screenshot, I screenshot. You know? There was this this season where they brought a new internship to work in the CTU you and the lady was showing him how to

start a security program in blah blah blah blah blah. I screenshot those screensavers and I use that to start it... And I use to start myself it give me the mind to study do security, computer security and I started it and I went for there to make my own... research online. (laughs) – *Willem, He/His*
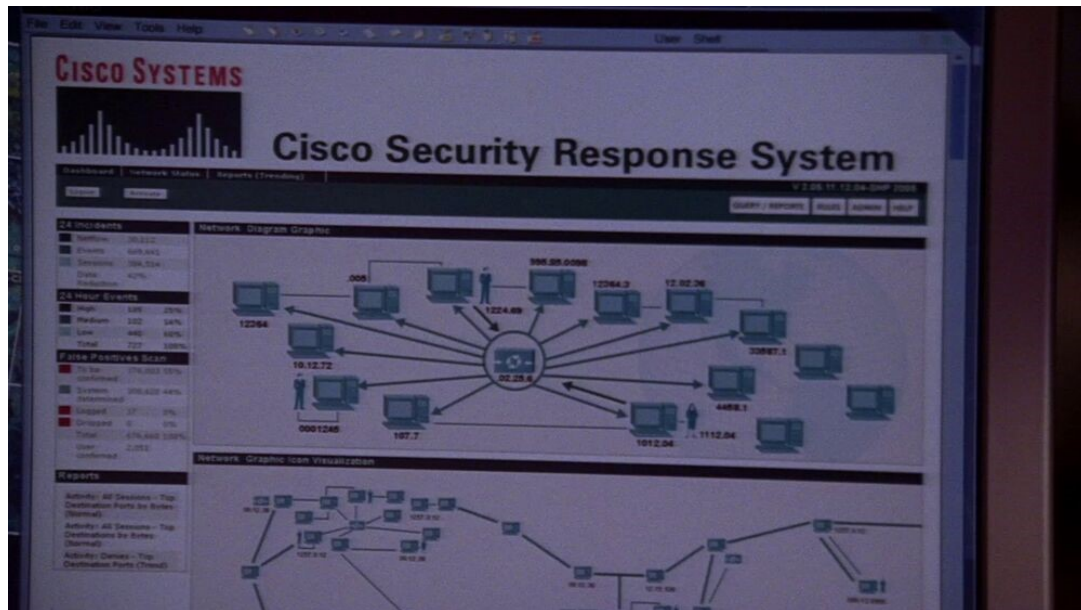
Figure 5 Screengrab from TV Show '24' showing a real Security Response System Source: FOX

He learned how to programme and learn about IPsec, an internet encryption protocol, by collecting and studying screenshots of the screens in a show about Counterterrorism. Later he will go on to study computer science and security and work for American software company Oracle.

As other students, he considers universities a very "corrupted" institution in which you are paying to get a paper that says you have learned that. Instead, they argue that universities should provide quality resources like engaging professors and facilitators:

So what I envisage in the future is a lot more self-learning platforms and universities providing platforms that are self-learning with less lecturers who are there but more pre-recorded things and then maybe an hour a week where there's a lecturer...

I see a future where only the actual like best people for teaching should be paid to be teacher. There are many people in this University who give it a go and they're good lectures because they they give it a lot of effort but they're not great and there are some lecturers who are just charismatic and fantastic presenting information. Yes, because that's what you're doing is lectures you're presenting information to an audience who's never seen it before they are trying to get them to understand they're excellent People are doing that. They're good at engaging in class. – Donnager, S/he

They also ponder about the outdated marking system in which we still based our educational systems and considered them " a farce" as students can virtually learn everything and the whole system push them to certain kind of jobs depending on their ability to demonstrate their skills thought a hierarchy marking system.

But that's because I believe in it's all as I said about University it is the problem is not University itself itself is the whole system like from the beginning the way we learn it's not about learning. It's about about getting some marks and you always-- the best mark it's the only thing that means something and that's not true because there is a lot of people with perfect marks and they're not able to do some stuff and the people with these with with the five can do another kind of work. *– Karina She/Her*

To sum up, the future of universities in the eyes of this students is certain that will still existing but the learning processes and the way we understand typical universities need to profoundly change.

Conclusions

Asking questions that lead to more questions is the basis of every scientific foundational discipline. The building blocks of our knowledge seem to be influenced by the same gravity that keeps our feet stick to the ground and our heads attached to reality. The reality of this particular meadow of the world is complex and cannot be explained with a couple of quotes and narratives from highly educated individuals.

Nevertheless, the conversations that I had with a handful of graduates invites us to reflect about the possibilities that they will face in their future. They argue that we will not see a steady and careful management of a technology that we might not fully understand. Perceptions range from the most optimistic ones in which AI will serve as a Firestarter for a socio-economic utopian revolution where there is no need for work anymore. To the most pessimistic ones, which talk about AI making people more useless, completely redundant and a threat to humanity. Neither are dominant themes in the discussions I had with university graduates. They are more inclined to a sceptical view in which AI will just be a very efficient and smart assistant for our more repetitive and mundane tasks and leave us with focus on the more humane part of it.

Something that I didn´t anticipate is the clarity to which graduates of all different disciplines see AI affecting their respective fields in the future. They all showed a pretty clear black and white picture of how AI could be use and could not (or should not) be used. Added to that, I didn´t expect to observe a

reality in which AI could virtually be used in every single occupation, no matter the objective or the purpose. Indeed, no matter if it is journalism, the rule of law, web design, clinical research, social research, conflict management... AI could be a very important tool for developing and assisting in tasks that were thought impossible or inapplicable. Such views suggest that more than a disruptor of their future professional careers, it will be another skill they will have to learn and progress with to gain an advantage in the competitive work market.

Machines that think like us were design and build to compete and gain the upper hand over enemy nations machines in wartime, that was the principle behind the work of Alan Turing and others in Bletchley Park. Nowadays, the goal is the same, create an advantageous situation between the ones who possess the technology and those who don't. This AI Divide will certainly disrupt but not in a sense of displace and replace but in a sense of engrossing an already existing digital divide and unequal access to technology.

Which bring us to the next set of conclusions. AI will definitely be used as a lever to propel or, on the contrary, ground graduates in their professional careers. Those who have the best access to the technology could have an even greater advantage to peers just possessing formal education skills. In this regard, most of the interviewees agree that the model Universities and other higher education institutions offer is too slow, too outdated or too impractical. Not able to keep up with the tide of times, often lacking updated topics or technologies that have had been using in the workplace for years. Indeed,

students do not feel very positive about how Maynooth University was providing a learning experience to meet their expectations. Administrative roadblocks, design of the degrees, inaccessibility to resources and lack of choice or impossibility of choice were the most frequent themes but above all, there was the one theme regarding the quality of teaching and the role of professors. Professors who are at bad engaging with their classes or they are not approachable, have a consequent effect of falling out of grace being label as "bad lecturers" and seeing their attendees' numbers drop. The way for universities to correct this and stay engage is often seen as inefficient and not useful. Resulting in a self-indulgence culture regarding better quality of teaching. Most of the interviewed students agreed that they preferred to skip the lectures, resorting to a self-learning platform to pass the module, rather than spending time and effort giving critical feedback about the quality of teaching in their departments.

The idea of "getting away with something" and freedom of choice is a topic that is implicitly mentioned in all of the interviews. I could not draw up a relation between the actual number of choices available for the students and their success or satisfaction on it. But it orbited more around the feeling that they have the ability to choose their own path without restrictions. This growth or lack of assertiveness or empowerment over their educational experiences seems to also draw links with various external pressures in their close networks from family, to friends, to co-workers, from the job market, etc.

Overall, the implicit or explicit objective that seemed to follow most of the students was of gaining a qualification that would allow them to present themselves as an attractive employable person. As mentioned, many times in this thesis, the instrumental credentialism factor is very acute in all of the interviewee's reflections.

The natural conclusion will be: Well, that is the objective of a postgraduate degree, to specialise and gain practical skills for an increase in employability...

The accounts of this group of students suggested that they are aware that postgraduate degrees didn´t give them any real employable skills. There is also a lack of hands-on experience provided by the university and the little empowerment and control they have over what they want to study. Is clear that universities have fallen from grace in the last couple of years. Students do not resort to universities for learning new skills after they have finished their traditional education paths and they have graduated with a degree. They rely strongly on other platforms like self-learning online courses and training by their employers.

Qualifications are really just a bona fide exchange of money and resources for a document you can use for access to more formal occupations and entering into organisations with the intent to progress hierarchically. In that regard, universities haven´t changed from their original intent which was to train factory workers into manager and above status. The more flexible curriculum and democratisation of the higher education system has only patched the already structural issue that exists.

More importantly, they also maintain that the skills they have learned will not really serve in a working environment but to learn new skills. Indeed, students seem to implicitly understand that university is not only a place for learning professional skills but is more of a provider of experience and personal growth that can shape their ways to learn in the future. If the experience of learning is unsatisfactory, they will find workarounds that do not engage with the learning provided by the university, but they will still be being actively involved in other facets of its lifestyle.

Political advantageous conditions can create buoyancy environments in education as they did in the 1960 USA and expand the qualities of higher education to the expected levels. It is imperative that we push for better policy in public education and the necessary funding for reaching the expectations of the prospective workforce. Not only because of the wishing thought of graduate students but because of the future of our communities depends on it. This is why providing them with a toolbox to learn skills so they can face the future is far more important now than ever.

Relevant Bibliography

Anon. n.d. "Margarita Álvarez: «El Empleo Del Futuro Será Más Humano y Menos Robótico» – Periodismo ULL." Retrieved May 8, 2019 (http://periodismo.ull.es/margarita-alvarez-habla-sobre-los-empleos-del-futuro-de-la-era-digital-en-la-ull/).

Anttiroiko, Ari-Veikko. 2015. "Networks in Manuel Castells' Theory of the Network Society." *Munich Personal RePEc Archive* (65617):35.

Aoun, Joseph E. 2018a. "Optimism and Anxiety: Views on the Impact of Artificial Intelligence and Higher Education's Response." *Gallup Inc.* January:1–38.

Aoun, Joseph E. 2018b. *Robot-Proof: Higher Education in the Age of Artificial Intelligence*. Cambrigde: The MIT Press.

Arntz, M., T. Gregory, and U. Zierahn. 2016. "The Risk of Automation for Jobs in OECD Countries." *OECD Social, Employment and Migration Working Paper*.

Banga, Karishma and Dirk Willem Te Velde. 2018. *DIGITALISATION AND THE FUTURE OF MANUFACTURING IN AFRICA*.

Basit, Tehmina N. 2003. "Manual or Electronic? The Role of Coding in Qualitative Data Analysis." *Educational Research* 45(2):143–54.

Benedikt Frey, Carl and Michael Osborne. 2013. "THE FUTURE OF EMPLOYMENT: HOW SUSCEPTIBLE ARE JOBS TO COMPUTERISATION?" *Oxford Martin Schoool*.

Bielenberg, Andy. 2011. "Ireland and the Industrial Revolution: The Impact of the Industrial Revolution on Irish Industry, 1801-1922 - By Andy Bielenberg." *The Economic History Review* 64(2):683–84.

Brown, Phillip. Keep, Ewart. 2018. "Rethinking the Race Between Education & Technology." *Issues in Science and Technology* 35(1):31–39.

Brynjolfsson, Erik and Andrew Mcafee. 2011. *Race against the Machine : How the Digital Revolution Is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy*. Lexington, Massachusetts: Digital Frontier Press.

Castells, M. 1993. *Improving Higher Education in Developing Countries*.

Castells, Manuel. 2011. "A Network Theory of Power." 5:773–87.

CGP Grey. 2017. *How Machines Learn*. YouTube.

Christensson, P. 2010. "ICT Definition." Retrieved July 7, 2019 (https://techterms.com).

Copeland, B. J. 2018. "Alan Turing | Biography, Facts, & Education | Britannica.Com." *Encyclopedia Britannica*. Retrieved July 6, 2019 (https://www.britannica.com/biography/Alan-Turing#ref704283).

CPG Grey. 2014. *Humans Need Not Apply - YouTube*. USA: YouTube.

Crowley, Frank and Justin Doran. 2019. *Automation and Irish Towns: Who's Most at Risk?*

CSO. 2019. "Labour Force Survey." *Labour Force Survey*.

Department of Education and Skills. 2011. *National Strategy for Higher Education to 2030*.

van Dijck, José. 2018a. "Education." in *The Platform Society*. Amsterdam.

van Dijck, José. 2018b. "Platform Mechanisms." in *The Platform Society*. Amsterdam.

van Dijck, José, Thomas Poell, and Martijn de Waal. 2018. "The Platform Society as a Contested Concept." in *The Platform Society*. Vol. 1. Amsterdam: Oxford Scholarship Online.

van Dijk, Jan A. G. M. 2005. *The Deepening Divide: Inequality in the Information Society*. 2455 Teller Road, Thousand Oaks California 91320 United States: SAGE Publications, Inc.

Doyle, Eric and Lena Jacobs. 2018. *Automation and Occupations: A Comparative Analysis of the Impact of Automation on Occupations in Ireland*.

European Commission. 2017. "Special Eurobarometer 460 Summary Attitudes towards the Impact of Digitisation and Automation on Daily Life March 2017 May 2017."

Expert Group on Future Skills Need. 2018. *Digital Tran s Formation : Assessing the Impact of Digitalisation on Ireland ' s Workforce*. Dublin.

Facer, Keri and Neil Selwyn. 2005. "Beyond the Digital Divide: Rethinking Digital Inclusion for the 21st Century." *National Civic Review* 46(3):4–8.

Gallup and Northeastern University. 2019. *FACING THE FUTURE U.S, U.K. and Canadian Citizens Call for a Unified Skills Strategy for the AI Age*. Boston.

Gow, Kathryn and Paula McDonald. 2006. "Attributes Required of Graduates for the Future Workplace." *Journal of Vocational Education and Training* 52(3):373–96.

Graduate Studies Office. 2019. *Maynooth University Postgraduate Prospectus*.

Gregersen, Erik, Robert Lewis, Gloria Lotha, and Neha Parwani. 2018. "Turing Test | Definition & Facts | Britannica.Com." Pp. 2–4 in *Encyplopaedia Britannica*.

Gurukkal, Rajan. 2018. "Graduate Attributes and the Challenge of Demand Uncertainty." *Higher Education for the Future* 6(1):1–6.

Halford, Susan and Mike Savage. 2010. "Reconceptualizing Digital Social Inequality." *Information Communication and Society* 13(7):937–55.

Havrda, Marek and Will Millership. 2018. "AI and Work - a Paradigm Shift?" *Medium*. Retrieved February 21, 2019 (https://medium.com/goodai-news/ai-and-work-a-paradigm-shift-7b314268bf05).

Higher Education Authority. 2016. *Developing Talent, Changing Lives*.

Hsiung, Ping-Chun. 2010. "Lives and Legacies. A Guide to Qualitative Interviewing." *UTSC Toronto*. Retrieved March 22, 2019 (http://www.utsc.utoronto.ca/~pchsiung/LAL/home).

Hu, Wei. 2017. : ": Robot-Proof: Higher Education in the Age of Artificial Intelligence."

Higher Education.

IWM Staff. 2018. "How Alan Turing Cracked The Enigma Code | Imperial War Museums." *IWM*. Retrieved July 6, 2019 (https://www.iwm.org.uk/history/how-alan-turing-cracked-the-enigma-code).

Kern, Isabelle. 2004. *Knowledge Management from Case Studies with ATLAS . Ti*.

Kitchin, Rob. 2017. "Thinking Critically about and Researching Algorithms." *Information Communication and Society* 20(1):14–29.

Luke, Eric and Peter Murtagh. 2016. "Leslie Greer: Natural Linguist Who Used Her Talents at Bletchley Park." *The Irish Times*. Retrieved July 6, 2019 (https://www.irishtimes.com/life-and-style/people/leslie-greer-natural-linguist-who-used-her-talents-at-bletchley-park-1.2723713).

Mitra, Sugata. 2003. "Minimally Invasive Education: A Progress Report on the 'Hole-in-the-Wall' Experiments." *British Journal of Educational Technology* 34(3):367–71.

Mitra, Sugata. 2013. "Build a School in the Cloud."

Nam, Taewoo. 2019. "Citizen Attitudes about Job Replacement by Robotic Automation." *Futures* 109:39–49.

Naomi Larsson. 2019. "'It's an Educational Revolution': How AI Is Transforming University Life | Education | The Guardian." Retrieved April 25, 2019 (https://www.theguardian.com/education/2019/apr/17/its-an-educational-revolution-how-ai-is-transforming-university-life).

Nedelkoska, Ljubica and Glenda Quintini. 2018. "Automation, Skills Use and Training."

OECD. 2016. *Skills Matter*. OECD.

Pouliakas, Konstantinos. 2018. *Automation Risk in the EU Labour Market A Skill-Needs Approach*. Thessaloniki.

Quality and Qualifications Ireland. 2019. "Qualifications Frameworks - A European View." Retrieved February 22, 2019 (http://www.nfq-qqi.com/qualifications-frameworks.html).

Rafael Reif, L. 2019. "Prepare Students for a Future of Artificial Intelligence." *Financial Times*.

Robinson, Ken (Sir). 2006. "Do Schools Kill Creativity?"

Schmidlechner, Lea and Daniel Molinuevo. 2017. *Automation of Work Literature Review Automation, Digitisation and Platforms: Implications for Work and Employment-Concept Paper*.

Stefano, Valerio DE. 2016. *CONDITIONS OF WORK AND EMPLOYMENT SERIES No. 71 The Rise of the «just-in-Time Workforce»: On-Demand Work, Crowdwork and Labour Protection in the «gig-Economy»*.

Steiner, Christopher. n.d. *Automate This : How Algorithms Came to Rule Our World*.

Szeles, Monica Răileanu. 2018. "New Insights from a Multilevel Approach to the Regional Digital Divide in the European Union." *Telecommunications Policy* 42(6):452–63.

Thomas, Gary. 2017. *How to Do Your Research Project: A Guide for Students (Third Edition)*. 3rd ed. London: SAGE Publications.

Tomlinson, Michael. 2008a. "'The Degree Is Not Enough': Students' Perceptions of the Role of Higher Education Credentials for Graduate Work and Employability." *British Journal of Sociology of Education* 29(1):49–61.

Tomlinson, Michael. 2008b. "'The Degree Is Not Enough': Students' Perceptions of the Role of Higher Education Credentials for Graduate Work and Employability." *British Journal of Sociology of Education* 29(1):49–61.

Tritsch, Joanne L. 2016. "Rise of the Robots: Technology and the Threat of a Jobless Future , by Martin Ford." *Organization Management Journal* 13(2):115–17.

Turing, Sara. 2012. *Alan M. Turing*. Cambridge University Press.

Wit, Kurt D. E. and J. E. F. C. Verhoeven. 2009. "Features and Future of the Network Society : The Demographic , Technological." (2008).

Wood, Alex J., Mark Graham, Vili Lehdonvirta, and Isis Hjorth. 2019. "Good Gig, Bad Gig: Autonomy and Algorithmic Control in the Global Gig Economy." *Work, Employment and Society* 33(1):56–75.

World Employment Confederation-Europe. 2016. "The Future of Work: Issues at Stake and Policy Recommendations from the Employment Industry." 39.

Appendices

Maynooth University Department of Sociology Masters Project
Consent Form

July 2019

I am Pablo D. Armas, a postgraduate student in the Department of Sociology at Maynooth University.

As part of my programme of study, I am undertaking research into **what impact Automation and AI is going to have on higher education measures to policy and contrast properly.** This project is designed to review the current higher education policy and contrast it with the current expectations of graduates or final year students in universities. I would value your participation in this project.

Participants will be involved in either a **Physical Interview** or an **Online Skype Interview.** In the case of a physical interview I will be using a voice recorder. In the case of an online interview I will be using Skype[1] recording manager (*Skype is owned by Microsoft Corporation. Read T&C and Privacy Policy below*) to record this meeting.

You are under no obligation to continue with the research once it is underway and can request that any interview or collection of information be stopped at any time.

All data will be anonymized, encrypted, stored locally in servers located inside the EU and deleted directly after completion of this research. Completed research projects containing anonymised data will be kept securely in **the Department of Sociology for no longer than 2 years.** Your data is protected under EU GDPR law.

While we try to keep all information confidential, in some circumstances, confidentiality of research data and records may be overridden by courts in the event of litigation, or in the course of investigation by lawful authority. In such circumstances the University will take all reasonable legal steps to ensure that confidentiality is maintained to the greatest possible extent.

If you have any queries before or after this research, you can contact my supervisor at:

Delma Byrne
Department of Sociology
Maynooth University
Maynooth, Co. Kildare
Tel: +353 (01) 7083723

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[1] Skype Communications S.a r.l. is owned by Mircrosoft Corporation. Read their terms of Use (https://www.microsoft.com/en-gb/servicesagreement/) and their Privacy Policy (https://privacy.microsoft.com/en-gb/privacystatement/)

1

Appendix A: Consent Form

Email: delma.byrne@mu.ie

If you are willing to be involved in this project, please sign the attached consent form. Your participation is greatly appreciated.

Researcher name: **Pablo D. Armas Sánchez**
Researcher contact details: **Pablo.armassanchez.2015@mumail.ie**
Project title: **University Graduates facing A.I and Automation in Ireland**

Please tick or mark digitally the following statements:

1. I have read and understood the information sheet	Yes ☐ No ☐
2. I have been given the opportunity to ask questions about the study	Yes ☐ No ☐
3. I have had my questions answered satisfactorily	Yes ☐ No ☐
4. I understand I can withdraw from the study at any time, without having to give a reason, up until the research is completed.	Yes ☐ No ☐
5. I understand that my data will be anonymised and deleted after use.	Yes ☐ No ☐
6. I agree that my responses will be recorded and transcribed	Yes ☐ No ☐
7. I agree to being identified in this interview and in any subsequent publications or use, by my online alias or otherwise.	Yes ☐ No ☐
8. I agree to my name/alias being used in the final research project.	Yes ☐ No ☐

Name	
Signature	
Date	

If during your participation in this study you feel the information and guidelines that you were given have been neglected or disregarded in any way, or if you are unhappy about the process, please contact the Secretary of the Maynooth University Ethics Committee at research.ethics@nuim.ie or +353 (0)1 708 6019. Please be assured that your concerns will be dealt with in a sensitive manner.

2

Understanding AI

1.

The more complex the thought this Suddenly It's you know, there's it gets exponentially more, you need more processing power. Yeah, eventually eventually, will will go mad scientist enough and we will create [01:08:23] something that is thinking on its own level it's thinking on a relatively complex level

Lack of Engagement/ Quality

3.

I see a future where only the actual like best people for teaching should be paid to be teacher. There are many people in this University who give it a go and they're good lectures because they they give it a lot of effort but they're not great and there are some [00:38:12] lecturers who are just charismatic and fantastic presenting information. Yes, because that's what you're doing is lectures you're presenting information to an audience who's never seen it before they are trying to get them to understand it, they're excellent People are doing that. They're [00:38:27] good at engaging in class

Bad Professors/ Replace by AI

2.

YouTube has been the greatest learning Aid in my entire life because most lectures to their credit try, and really try. We had another lecture who just kind of didn't really..... [grasp] ...... didn't really- (pause) the best way I can say it is they're teaching is dated, their teaching style was dated

Optimism about AI

5.

Personally, I feel like I have to be specialized in something that can't really be automated completely to be subject to human design which is why I got actually really enjoy UX, UI design just kind of like, okay, I can play around with this. I can present things with this. This is this is something I can do a lot of work with but can't necessarily be automated completely because it solves it human Flair to it.

Future of Universities/ AI learning

4.

So what I envisage in the future is a lot more self learning platforms and universities providing platforms that are self learning with less lecturers who are there but more pre-recorded things and then maybe an hour a week where there's a lecturer...