A framework for the introduction of advanced technologies into the workplace

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A dissertation submitted to Wrexham Glyndŵr University in accordance with the requirements of the degree of Master Business Administration

(October 2022)

'Tomorrow belongs to those who can hear it coming'

David Bowie

Table of Contents

Table of Figures

1. ABSTRACT

The proliferation of technology in society is advancing in functionality and ability. In the workplace advanced technologies are being introduced to supplement or replace the human workforce. However, workers may not have sufficient representation to have a say in their future of work. Businesses face challenges of worker demotivation and dissatisfaction leading to lower-than-expected results. The benefits of efficiencies brought about by technology introduction are well understood whereas the aspects of having the HRM department represent the workforce, awareness of future legislation, acting ethically and becoming a stakeholder in digital transformation projects is not sufficiently understood.

This research seeks to address the gaps by identifying a framework which can be used within businesses by the HRM department to ensure ethical standards and corporate social responsibility is maintained. The research questions if the introduction of advanced technologies can negatively impact the workforce and society. Data is gathered through semi-structured interviews, sample size 6 industry technology professionals, using NVIVO software for qualitative analysis.

The research found that HRM departments are not project stakeholders, do not represent the workforce, there is a lack of regulation and ethics. Technology has both motivational and de-motivational effects on the workforce. Business seeks efficiencies through removing humas and seek to use advanced technology. The implication is that using a HRM framework will seek to address these issues protecting workforce welfare and future societies.

For practitioners, the research provides the HRM department with a framework to become a project stakeholder and represent their workforce. For academics it provides greater knowledge of why HRM is not be involved and is a baseline for future research on societal issues.

Key words: advanced technology, human resource management, robotics, digital ethics

2. BACKGROUND

Robotics in 2022 is said to be having a boom year (Bove, 2022). This is partly due to the current labour shortages in Europe and the US caused by the covid pandemic and the acceleration by companies to replace humans with robots (OECD, 2021). Businesses are implementing advanced technologies to have a workforce that never sleeps, does not require wage increases and are highly efficient at repetitive processes. The introduction of technology has the potential to reduce humans from the workplace or remove them altogether. Introducing technologies is typically chaotic and many digital transformation projects achieve reduced outcomes. There are psychological effects on remaining human workers and longer-term societal concerns (Quinlan, 2022). In non-unionised workplaces workers rely on the HRM department for their benefits package, training, mobilisation, and demobilisation. The HRM department is typically not involved with technological projects, yet these have the biggest impacts on the future of work and the welfare of workers and have a role for corporate social responsibility.

3. INTRODUCTION

The research aims to explore if HRM has been involved with digital projects and how they represent the workforce. The research asks the question if the introduction of advanced technology in the workplace can lead to motivational and societal issues. The aim of the research is to provide a framework which HRM departments can use to become a stakeholder in these projects so they can ethically represent the company and the workforce to ensure that humans are considered in technical projects requirements.

The approach to the research was to undertake a qualitative study using semi-structured interviews with technology consultant professionals primarily from the aviation sector. The aviation sector has large areas of human workforces undertaking repetitive tasks such as preparing meals in catering facilities, processing passenger hold baggage in a baggage factory and processing cargo pallets from freighters in cargo terminals.

This research is warranted as it has shown through the research interviews that there is a lack of theory regarding the involvement of HRM in technology projects. It was found that typically a business engages external consultants to lead their advanced digital transformation projects (ICT change projects) and they do not seek to engage the HRM department to discuss employee involvement in the project requirements and agree how humans and machines can work effectively together, this was supported by the research data. A literature search has shown that there is no governmental legislation or guidelines to ensure companies are implementing technologies in an ethical manner. Particularity the research focuses on whether the HRM department is involved, to what extent, what technologies are disrupting the workplace, how are employees engaged and is there an ethical charter within businesses for HRM departments to follow.

Existing work on this topic contains viewpoints from advanced technology perspective and the future of work and the future of society. Existing work on HRM reward models and the functions of HRM are extensively covered. There is a gap in the research as to the extent the HRM departments should be involved as a stakeholder to be communicated with at the inception of digital transformation projects.

The research is timely as the covid pandemic has accelerated workers expectations for increased wages, working from home and flexible benefits. There is a labour shortage in particular industries such as airports. A mixture of Brexit immigration policy and better working conditions has caused many airport workers to permanently take alternative

employment. There is also a gathering of pace in industrial workplaces. 'Industry 4.0' which is the introduction of advanced technologies into the manufacturing, coupled with increased data gathering from Internet of Things (IoT) devices and data processing through Machine Learning (ML) (Bove, 2022). Digital transformation is occurring in all workplaces which is the introduction of advanced technologies such as artificial intelligence (AI), machine vision, robotics, and digital twins. The concept of a 'singularity' is when machines advance to such a level that they outperform humans in every aspect, physically and mentally. Once the point of singularity is reached humans will no longer be required in the entire workforce (Nunes, 2021).

The research methodology chapter establishes the rationale for the qualitative approach taken, how the interviews are structured and why thematic analysis has been chosen as the appropriate method for interpreting the data. The results and findings chapter interprets the results and provides a thematic map which details four main themes. Each theme has been briefly described along with any high-level key findings. The discussion chapter expands upon each theme and interprets the findings into a recommended framework for the HRM department. The conclusion chapter provides an overview of the research and recommendations for further research.

The researcher works within the aviation industry designing airport system and implementing these into airport environments. Operational departments prepare technology roadmaps for planning horizons typically up to 15 years in advance. These include establishing how to maximise the efficiency of existing technologies and exploration of the latest technology or concepts. The business drivers are to provide new services for customers, staying ahead of the competition, seeking ever increasing efficiencies of the human workforce. The industry fortunes have been depressed due to the covid pandemic and efficiencies are become a priority. The ultimate goal of most airports is to seek complete autonomy for the processing the passenger so that they are self-sufficient so that the airports have minimal employees.

4. INTRODUCTION TO LITERATURE REVIEW

Businesses seek to become more efficient to provide their services at a competitive price relative to their competitors. They introduce innovative technologies to augment or replace repetitive human tasks seeking lower costs. The majority of the workforce does not have a voice in the development of technologies even though they will eventually have to collaborate with them, alongside them or even be replaced by them. This raises the concern that the human workforce may become devalued, demotivated or even hostile towards technological change and advancements within the workplace. The net effect is that the expected productivity gains may not be realised or only partially realised. Therefore, questions are required of companies' leaders, managers and HRM departments which justify this research proposal:

1. Could the introduction of advanced technology in the workplace lead to motivational, productivity and societal issues?

The aim is to produce a framework for the HRM department to use for digital transformation projects. The research is justified as contemporary society has seen a shift in workplace expectations by both business owners and the workforce. The global Covid-19 pandemic has resulted in new flexible working methods for which there are signs of conflict in expectations between a business and its workforce. The pandemic has also forced businesses to seek to implement efficient technologies or drive innovation towards innovative technology that is less human reliant. The pace of development of advanced technologies such as machine learning (ML), artificial intelligence (AI) and advanced robotics makes the research critical if businesses are to implement technology successfully. The general term used today as applied to these developments in business is called 'Industry 4.0.' The research is important to avoid failure in technology introduction leading to inefficiencies and lost capital investment opportunity.

4.1 Research Relevance

This Industry 4.0 research topic is also being debated internationally at governmental levels. In 2021 the UK government launched the National AI Strategy to focus on ethics, economic growth, and people skills (Keeling, 2021). Within the EU the European Parliament has a wider and more comprehensive remit which is to advance digitisation in all EU countries. In the USA President Obama commissioned the Preparing for the Future of AI Report (2016) encompassing all government departments including the spectre raised by AI in military defence and security agencies. These three initiatives all have a similar theme to advance technology in the workplace and re-skill the workforce. They do not provide any awareness of that the future digitisation could reduce the overall number of workers and lead to increased unemployment burdening the economy hence they do not seek a holistic view to ensure adequate preparation.

The authors M et al (2019), Ford (2015) and Akdogan & Vanli (2020) summarise this research vantage point well. Working environments are becoming increasingly dependent on latest technologies and autonomous (M et al, 2019). To survive an organisation must seek to maximise efficiencies to remain competitive against similar organisations which undertakes routine processes and tasks using a low skilled and generally low paid workforce. Ford, (2015) states that most jobs are actually routine and therefore at risk. Implementation of the latest available technologies offers an opportunity for increased efficiencies. According to Akdogan & Vanli, (2020) manufacturers are trying to survive by using such technology advantages. Together these statements propose that jobs may be at risk. An alternative view is provided by Ashley Nunes (2021) who states that 'Automation Doesn't Just Create or Destroy Jobs, It Transforms Them'. This demonstrates that there are opposing views regarding the loss of workforce to technological advancement.

4.2 Structure of the Literature Review

There are three main themes involved in this review. An Industry 4.0 introductory section is provided to demonstrate the pace of technological change to date. Secondly, the review explores if there is agreement to the profound implications upon professions caused by Industry 4.0 and future advancements. In this the pace of technological advancement and the timescales towards a 'singularity' is critical. This is the main area of debate amongst the authors and contributors to the subject such as Ford (2015) and Akdogan & Vanli (2020). Finally, the review explores the management theories and models which may have been developed for introduction of current technology.

4.3 Review Methodology

The methodology was based on searching the primary sources of information around the themes of HRM, Motivation, Advanced Technologies, and Industry 4.0. Specifically, artificial intelligence was researched as this may create the more significant disruptions within all organisations to all workforce grades and not only the lower skilled, lower paid grades. A broad review of the literature has been conducted using the following sources to assess the relevant themes and debates in introducing technology into the workplace.

4.4 Search Sentence

The following key search terms have been used across the sources of information:

1. Robotics+HRM+Motivation
2. Artificial Intelligence+HRM+Motivation
3. Industry4.0+HRM+Motivation
4. Industry4.0
5. Technology+HRM+Motivation
6. Technology+Airport+Motivation
7. Technology+Workforce+Motivation+Airport
8. Technology+Workforce+Motivation
9. Impact on motivation+technology introduction

4.5 Sources of Information:

The primary sources of information used in undertaking the literature review are:

1. Core
2. DOAB
3. Internet
4. Books
5. Journals

5. LITERATURE REVIEW

5.1 Introducing Industry 4.0.

There is an increasing proliferation and capability of technologies through time. The first industrial revolution was mechanical and occurred from late 1700's to late 1800's. The focus was on mechanical machinery. In the 1900's electrical energy allowed for mass production using more efficient machines. In the latter half of the 1900's computers arrived which allowed for automation and control systems. This period also saw the use of robotics and digital integration of systems through the exchange of signals which may produce cause and effects between the systems. Local area networks and the internet allowed for increased communications between these systems on a global scale.

As time progresses the degree of complexity or 'intelligence' of the individual systems exponentially increases. In the past two decades the development of artificial intelligence and machine learning as a control mechanism over all other systems has progressed sufficiently to allow full robotic autonomy of repetitive tasks which can be scaled depending on external factors, signals received from other input-output systems. Figure 1 provides a useful summary.
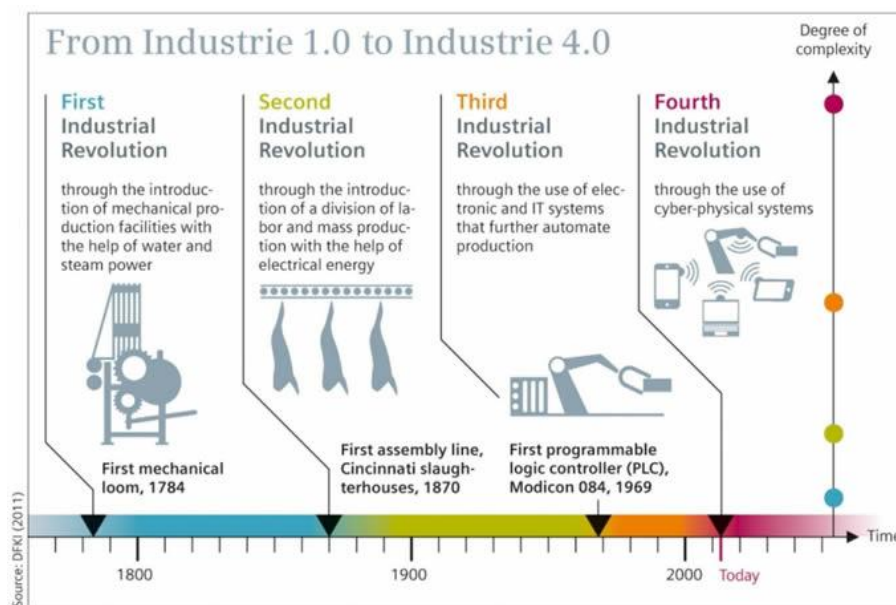
Figure 1: Industrial revolutions 1.0 to 4.0, reproduced from DFKI (2011)

The fourth industrial revolution uses the umbrella term Industry 4.0. This covers the more advanced technologies which are depicted in Figure 2. The rapidity of developments coupled with an organisations' need for efficiency to remain competitive may according to Ford,

(2013) have frightening societal implications if jobs with some levels of routine are automated replacing humans and affecting their prosperity.

Figure 2: Industry 4.0. Kim et al, (2018).

5.2 Historical Effects of Introducing Advanced Technology in Industry

The literature review has shown that the global workforce has undoubtedly changed over the past few decades. This has produced two themes of thought. One theme is that innovative technology causes higher unemployment and conversely that technology increases employment in the long-term (McLoughlin, 2022).

The proliferation of computers in offices and connected machines within industry has shaped a workforce with new technical skills and new roles. However, it is argued that those new roles are not equal in quantity or value to the roles left behind. Hemous, (2016) states that over the previous 40 years deteriorating wages and dramatic changes in income distribution are attributed to the use of machines where automation increases economic output yet reduces demand for certain jobs, particularly low-skilled. Jaimovich and Siu, (2012) argue that job polarisation and jobless recoveries have occurred due to the trend of automation particularly following a recession. Ford, (2015) states that in the first two decades of the twentieth century there were no new jobs created. Productivity increases which previously may have been distributed to the workforce are now benefiting organisational owners.

Borchowsky, (2019) argues that the classically held views that technology could not create long term unemployment are rapidly changing. This is called the Lump of Labour Fallacy. Economic observations in the past 20 years are highlighting that there is not a fixed number of jobs in the economy and the stagnation in employment numbers and wages is in part a cause of technology and automation (McLoughlin, 2022).

5.3 Implications Upon the Professions

The work of Ford (2015) and Borchowsky (2019) is most important as it challenges the long-held view from economic historians such as Perez (2002) that innovative technology does not cause a reduction in the number of people in the workforce. An interesting footnote from Perez in demonstrating this is 'Contrary to what one would have expected, the number of horses actually increased for more than 50 years because of the need for horse transport from railway stations to ships, houses, inns and so on'. By 2025 'the World Economic Forum estimates that technology will create 12 million more jobs than it destroys' (Nunez, 2021).

Ford's view is concerning for the workforce as they may lose their jobs however it is good news for the business owner as it indicates additional cost efficiencies. Throughout history the introduction of technology into the workplace has caused negative reactions from workers who are required to learn new working methods, re-train for new roles or are being removed from the workplace entirely. This is acutely seen in demand fulfilment organisations such as Amazon who rely upon autonomous workers for the majority of stock pick and packaging. However, there are opposing views as to the current and future trend of whether innovative technology will create new jobs.

Since the 1980s about 50 percent of all new capital investment in organizations has been in information technology (Westland and Clark, 2000). For that investment to improve productivity these technologies must be accepted and used by employees in organizations. (Patel, Connolly, 2007).

The literature review shows that there is an alignment of thinking that automated technologies will continue to advance in ability and be integrated increasingly into the workplace. There is not a consensus on the timeline of technological change. Mayer, (2017) predicts that between 400 million and 800 million jobs will be automated by 2030. The World Economic Forum (2019), states that task disruption means that the "human" share of labour hours will decline from 71% to 58% by 2022 for today's known tasks. This dramatic fall in labour hours and reflects the widely held view that the future roles to be automated will no

longer be low-wage blue collar workers but white collar. Professions such as law, healthcare, finance, education are all affected. The World Economic Forum (2020) also states '85 million jobs may be displaced by the shift in labor between humans and machines by 2025, while 97 million new roles may emerge'. It is clear that opposing messages are appearing from the World Economic Forum and demonstrates the lack of consensus and confusion on the topic. They also publish a forecast of jobs in future demand versus those declining. Of particular note it's not just the manual jobs which are disappearing such as construction workers, assembly, and factory workers but also the white-collar jobs such as accountants, business managers and human resource specialists. The World Economic Forum report (2020) focuses on the 'jobs of tomorrow' however does not provide any guidance to the current workforce who may for many reasons not be able to retrain. It is the future workforce which is the thrust of the report. Although there may be opposing views on whether the future jobs will replace existing jobs and whether the rate of change will be rapid or slow the report does not contribute to the discussion on how existing workplaces are to prepare. It is more concerned with illuminating today's students so that they make particularly choices which are part of the ICT ecosystem. Orduna (2021) offers the view that 'Technologies are moving so fast that to be a competitive candidate, you will need to learn the latest tools and digital trends in your industry'. This is only helpful to the younger generation who are already aware of and experienced in the digital world. The manual labourers and industrial workers are left out of the conversation.

It is the HRM department within a business that will prepare for organisational change however the World Economic Forum report suggests that it is the very same resources which will not be required in the future. The most advanced companies such as Google and Amazon are already using AI to search through a job candidates resume and make autonomous decisions as to the best fit candidate. It is only a small step into the future for AI to also take decisions on which resources should be retained, retained, or released when organisational downsizing needs to occur or introduction of technology.

There is not the general realisation by workers that many software programs today are capturing all the data to replace humans (Ford, 2015). This is called e-discovery software. In 2013 University of Oxford Martin School estimated 50% of US jobs will be susceptible to automation. However, there are also opposing views that not all AI creators consider that the advancement of artificial intelligence into a general human intelligence whereby tasks are performed better than humans is not a meaningful or even possible goal (Wilks, 2019).

Authors and academics agree that there are great advantages to robotic process automation brought about by Industry 4.0 technologies and agree that organisations do not want to hire more humans (Ford, 2015). Organisations are attracted to the efficiencies of workers who can be turned on and off at a moments notice, never get sick, never unionise, or ask for wage increases. Tegmark, (2017) identifies that the whole bottom of the job pyramid could be automated by taken by automated technology. He posits would people of the future prefer a jobless society where everyone has a life of leisure, and the machines do the financial earning. Robots are not consumers and therefore cannot add financial benefit to the economy through purchases unless they result in cheaper products for people to buy causing downward inflation (Pettinger, 2019). Ford's statement regarding the capturing of data is not surprising however technology incorporation into a workforce is typically a slow drift. This may be accelerating today and Pettinger provides a useful alarm bell that the replacement of workers with robots will cause a wider negative effect to society as a whole as opposed to the quick win for the business.

Susskind and Susskind (2015) provide a complimentary review of implications resulting from the evolution of technology in the workplace. They start with the theory that the workforce in the present day exists because humans do not know everything at once and therefore, we need specialisms to provide what we do not know. People have a trust in these specialisms. Questions are asked to establish the implications upon our trust of a computer automated doctor or psychiatrist, how do we ensure there is no corruption, that there is no bias, is it right that we should lose human craft skills, will there be empathy? These views from Susskind are particularly important, the technology advancements are with us today and have been introduced without a great level of debate. For instance, the National Health Service mobile phone application takes users through a series of questions before either diagnosing the patient or finally passing them onwards to an appropriate consultant.

There is significant debate regarding the ultimate effect of automation and artificial intelligence as either a positive or negative force. The International Federation of Robotics (2017) says robots complement and augment labour, the future will be robots and humans working together. A stark warning comes from Stephen Hawking who warns "artificial intelligence could end mankind" (BBC, 2014). De Cremer and Garry Kasparov (2021) state artificial intelligence should be complimentary with Authentic Intelligence. It is the two together which will produce the best result. Their future vision is that humans and machines work together in what is termed Augmented Intelligence. This advances the rounded view of the literature and is a more palatable version of the future. Wilson and Daugherty (2018) share this view, they surveyed 1500 organisations to assess technology implementation and

found that the biggest improvements in performance are when an augmented approach is taken, and smart machines and existing human employees are tasked together.

All the views from academics and technology research authors agree that there will be an advancement in technology and that this will disrupt the workforce. There is debate as to whether this advancement will replace the workforce totally in particular areas or disrupt it into new ways of working yet the overall quantity of jobs remains the same. This is the concern of writers who realise that the elimination of humans from the workforce may have easily perceived benefits such as more leisure time, an autonomous lifestyle devoid of any actual need to work as populations may be offered a universal minimum wage but have a downward effect on the economy as whole. Ford (2015) provides a useful sound bite 'machines do not consume'. The theory is that as humans are replaced, they are no longer able to contribute to the economy as they do not buy good, do not pay taxes, and are required to exist from government benefits. The warning is not to replace the mass market with robots. Similarly, the quality of jobs in the economic sense also has the same effect.

In May 2022, the UK Prime Minister Boris Johnson applauds government strategy that has brought about the lowest unemployment rate since the 1970's. This drop in unemployment has been filled by predominantly workers in the gig-economy. The gig-economy workforce is bereft of normal workplace rights and benefits. They typically work for lower wages and therefore have less disposable income to spend on consumer goods. The economist Joseph Stieglitz (2013) stated that inequality is squelching our recovery. The theory is that the American middle-class workers had less money and therefore less spending power, for economic growth to occur the middle class should earn more and the wealth of the top 5% should be diluted. A similar view is held by Cynamon and Fazzari (2014) and they determined that economic growth is therefore only possible by the middle and bottom classes borrowing and taking on debt.

This theme may be outside of the limitations of a company's HRM department especially if the business is driven by increasing profits and not a charitable organisation. Taking the themes from all the above authors together the future of the workplace has multifaceted aspects of motivation. The conversation needs to be widened beyond individual motivation of humans in the workplace and an assessment undertaken of the contribution to society and the economy as a whole. Motivating a human workforce may be a stopgap with an inevitable end goal that companies' profits rise faster than employees' wages with less consumers able to purchase goods and services.

5.4 Towards the Singularity

The area of greatest debate between the authors surrounds the rate of AI advancement and the moment in time when AI can become what is termed a 'singularity' (super intelligent beyond the human capabilities). The singularity may have the greatest impact on the future of work, the workplace, and the workforce. Hawking & Wilczek (2014) wrote that a computer capable of exceeding human intelligence would be the biggest event in human history, capable of outsmarting financial markets, out-manipulating human leaders and developing weapons we cannot even understand. They went on to describe it as 'potentially our worst mistake in history.' Barrat (2013) asked four computer scientists as to when this event may occur, and the answers showed that 42% said such a machine could exist by 2030. 25% by 2050 and 20% by 2100. The estimated timescales are in part based on Moore's law who stated in 1965 that 'the number of transistors in a dense integrated circuit double about every two years. Simplistically this means that computing speeds double and can perform tasks more efficiently and quicker. The dominant writer is Kurzweil who foresees that humans will inevitably merge with machines of the future using techniques such as augmented brain implants. This demonstrates that the singularity may in part be human based which has major repercussions in that it has the potential to extend a human's lifespan. The literature shows that on one side of the debate there is a belief that there will be continued exponential development. On the opposing side authors such as Steven Pinker states that 'there is not the slightest reason to believe in a coming singularity.' However, the literature review did not find many authors who shared Pinker's optimism and therefore the Singularity cannot be dismissed as the realm of science fiction. It is agreed upon that there has been an advancement in technology in a relatively brief period. The industry is now dominated by new research into advanced technologies well beyond robotics and AI such as nanotechnology and quantum mechanics which will, when mass produced and introduced to the workplace, represent a significant leap forward in automation and efficiencies for businesses.

Boden (2016) states that AI's future is hyped and that the predictions are overly enthusiastic and that such predictions are near worthless. Boden does not add to the topic by explaining why these pessimistic views are held however any advance predictions concerning the future of humans in the workplace to 2050 will always be a best guess. It ignores the often-used tactic of technologists when they look backwards to 1980 for example and asking at people at random whether computers and mobile phones would ever become common place in society. Nobody could predict the worldwide proliferation of such devices and there intertwining with many aspects of everyday life. What was once seen as niche for big

businesses has now permeated every aspect of modern life. It is not useful in the debate to arbitrarily dismiss predictions as near worthless.

5.5 HRM Approaches to Technology Introduction

As proposed by Hecklau et al, (2017) Human Resource Management (HRM) departments are required to manage the intrinsic and extrinsic packages of the labour workforce in the advent of Industry 4.0. This includes ensuring that employees are suitably motivated to undertake their work. Historically HRM departments have been criticised for not participating in the process of technology introduction leading to difficulties in implementation and slow periods of adoption. According to Stein & Scholz, (2020) benefits and symbiosis between humans and technology is failing because HRM has widely ignored the topic of automation. Omar (2021) categorised the survey results from approx 150 respondents who described the challenges faced by the HRM department of the future. Titles such as developing leadership, attract and retain, learning and development scored extremely high as current and future challenges however change management was amongst one of the lowest scores in terms of concern. This is surprising as successful modern organisations no longer view the IT department as a siloed entity merely providing IT support but rather as an essential service which also drives and enables innovation. This demonstrates a lack of responsibility by HRM departments in that digital transformation may be left to others in the organisation. Fortunately, Bradley (2022) recognises the significant role HRM must play in ensuring employee resistance is overcome to technical change projects and that workers are retained. It is imperative that HRM departments have a toolset to support change management in digital transformation projects. Key to this is helping the workforce see technology as an aid and not a hindrance, helping them realise their independence and meaningful place in the organisation.

As the future technologies will be even more advanced and we face the possibility of replacing many workers altogether; as Tegmark, (2017) states 'are we inevitably making ourselves obsolete?' it is of vital importance to understand how humans and technology can coexist and work in harmony. This is also the challenge of the HRM department. The literature was reviewed and analysed for existing frameworks which may exist to support technology introduction. A study of the company KornFerry (2022) shows that there are 7 key trends which affect the future of work which HRM departments have to support. One of the key trends is 'individuality,' yet when 1500 employees were surveyed as to the top trend which they believe they're company was ignoring at their peril it was surprisingly

'individuality'. In short employees want to feel that their approach to work can be individually tailored to meet their own individual needs.

According to (M et al, 2019), it is imperative for us to take a close look at the developments, understand their dynamics and be prepared for the future'. Hawking stated artificial intelligence it was the most important conversation of our time. HRM will face internal and external influences in their strategies for an autonomous workforce. If this really is the most important conversation, then it would be expected that all business strategies would be engaging the HRM department to help resolve the future of work.

The European Parliament Policy Department (2016) set out a basis of topics which may affect the HRM department such as ethical principles, concepts of liability, protecting human liberties, managing data, maintaining social ties between humans and more interestingly the incongruity of establishing robots as liable legal persons. HRM will eventually have to consider aspects which in time may become regulatory requirements.

The Artificial Intelligence Cooperation (2020) states we need to work cooperatively with AI systems and do not give them the power to make decisions which affect us. This will require careful job planning by the HRM department if maintaining motivation is key to the efficiency gains to be made. The HRM department may have to focus on the legal rights of human capital as well as robotic intelligent capital.

All IT innovation implementations within organisations are widely acknowledged as turbulent and conflicting developments that demand the implementation of different technical and social changes (Bondarouk & Looise, 2005). New Terminology is offered by Stein & Scholz (2020), and the acronym HARM is used to describe Human Automation Resource Management. If the implementation of yesterday's technology, such as a new office computer system, was incredibly challenging for HRM and their role is about to be much larger in the future.

Agolla, (2018) offers a competency model for managing the human capital in the Industry 4.0 revolution and maintaining motivation. Based on clearly defining the organisational culture, training, creation of diverse teams, involvement in meaningful work but not overpaying the workforce. This model is based on integration of humans and machines. Richards, (2017) provides a model of human-agent teaming where the agent is the automated algorithm or robotic colleague. This focusses on the element of control one may have over the other especially when they are working side by side. You & Robert, (2018) provides a model of

how a human may learn to trust a robotic worker or artificial intelligence which ultimately determines the willingness to work with each other and therefore increase efficiencies. It is evident that there are new dynamics required within HRM from external influences, internal influences, role design, benefits and renumeration and co-worker dynamics. There is a common theme in many of the authors works that training is a key part of the framework for technical change however there is a predominance of focus into the view that jobs will not be lost, be devalued, and that the workforce will merely transform. A HRM department that continues to use models such as Maslow (1943), Herzberg (1959) as a basis for organisational design are very outdated. These theories were never intended to cope with the digital transformation witnessed today. Modern theories such as Equity, Self-Efficacy and goal-setting theories are also outdated and not focussed on the nuances required. The bigger conversations required to make an effective HRM model need to provide answers upon AI and inherent machine learning bias and whether the employee will be at a disadvantage from the outset? To what extent will the machines used in Industry 4.0 be trusted to instruct humans and can they be fair? Will they provide complete transparency of decisions? The HRM departments themselves need to be taught in the developments of Industry 4.0 so they fully understand their impacts and implications. It is not enough to support a technical change without considering the responsibility for human impact.

Crowley (2014) identified within Google that a framework of humanising technology existed which focussed around allowing employees multiple technologies and methodologies on how they wish to communicate and work. They allowed technology to support the employees in personal lives, they retained a once-a-week personal meeting culture and then encouraged them to disconnect from technology for a period after work. This is 6 years pre-pandemic and demonstrates that forward thinking, non-industrial companies, had the HRM planning in place to support the business strategy putting employees in charge of their workload and maintaining their individuality. The ability to continuously change and be dynamic is at the heart of how big tech companies operate. This level of thinking may be advantageous for more industrialised businesses which are manual labour driven.

Phoebe and Moore (2019) argue that the HRM function needs to ask *Why implement AI into the workplace at all?*. They are concerned with the ethical debate and is it humane to introduce technology that can create so many problems for humans and society. They rightfully ask will the introduction promote better working conditions, aid the welfare state, improve the qualitative experience of the workplace. They too are concerned with discriminatory behaviour and agree with Christian (2020) that machines, however intelligent we call them, only behave in the way that humans have taught them and are therefore

inherently discriminatory. The consensus is for HRM to focus on the tension points which we already see between humans and technology and even call for regulation where human intelligence is always superior to machine intelligence. Humans should have the last word. Kissinger, Schmidt and Huttenlocher (2021) also agreed that regulation will be required to counterbalance the future advancement of AI to protect the human and human worker. These views however may be opposed to particular businesses strategies of becoming increasingly efficient, profitable, and successful in the marketplace.

5.6 Literature Review Conclusion

The literature review has discussed the theory of workforce changing over time because of innovative technologies being introduced. The classical belief that the workforce can be retained, re-skilled and re-distributed when technology is introduced may no longer be dominant. There is a realisation, at least a cognisance of the possibility, that the future workforce may not be required at all, this is a focus of the research questions. The ideas dominant in the 1900's and even early 2000's that all technological advancement leads to a shift in working methods but does not reduce the quantity of overall jobs are now being challenged. This is especially important for businesses as they will have many aspects to consider. Undoubtedly, they will seek greater efficiencies and cost savings however there will always be a transition between a human workforce and a robotic workforce driven by advanced AI.

There is no better example than Amazon which started with an online bookstore in 1994. At this time books were manually packed, prepared, and delivered. By 1998 the Amazon business grew into the online delivery of additional products, the warehouses and overall size of the workforce grew in sync. By 2016 they had developed their own cloud-based web services, and automated warehouses were the only workforce required is to maintain the robotic pickers and stackers. Selection of Human Resources was by computer AI. In 2020 Amazon is investing heavily in drone technology to undertake the last-mile demand fulfilment from their automated warehouses to the customers door. Again, the only human workforce which will be required is the maintenance teams. In just under 30 years this digital transformation has taken place. It is only expected that Moore's law, for now, still exists and that the pace of change will be quicker in the next decades.

A businesses HRM department needs to manage the transition of manual workforce to an automated workforce. It the transition occurs to quickly and with no forethought there will be a backlash from the workforce. In 2022 this was acutely seen when the ferry operator P&O

wanted to replace its UK workforce with a cheaper foreign workforce having already reduced the workforce side to the minimum required by law. The results were negative and ranged from dire media coverage and consumer perception to labour marches, class action lawsuits and government intervention on minimum wages.

It is vitally important that HRM prepares for the step-change that will require new strategies to be put in place for both the blue- and white-collar workers. In particular cases, this may also mean a digitised HRM function and a reduction within its own department. There are conflicting views between academics and organisations who produce Industry 4.0 technologies with regards to unemployment impacts and timescales. As an example, a workplace which in 2022 which may contain a highly motivated workforce honed through years of managerial process refinement and HRM policies of motivation such as flexible working, equal renumeration with other sectors, career progression etc can easily be disrupted if a robot or AI was to partly or wholly undertake their role. This may be in various forms. Uber drivers for instance have no interaction with managerial staff, they receive all their work instructions via a mobile phone application. Amazon maintenance staff receive their instructions via a similar mobile application. The human interaction with others in the workplace, which once was the norm, has been eradicated. The monetary investment by the businesses is predominantly inwards to enhance the applications efficiency, advertising and reach to end consumers. The human workforce in the middle is not invested in as their roles are quickly replaceable requiring little qualifications or unique skill sets.

There is a societal and economic aspect to the replacement of humans in the workforce. The reduction of workers and/or the dilution of wages means that there is less money to spend on the good and services of that company. The economy declines as a result. A good example of this is economic aspect is Henry Ford the car maker who in 1914 doubled the wages of his workforce so they would be able to purchase his cars (Anderson, 2014). There was a realisation that suppressed wages has a similar economic effect.
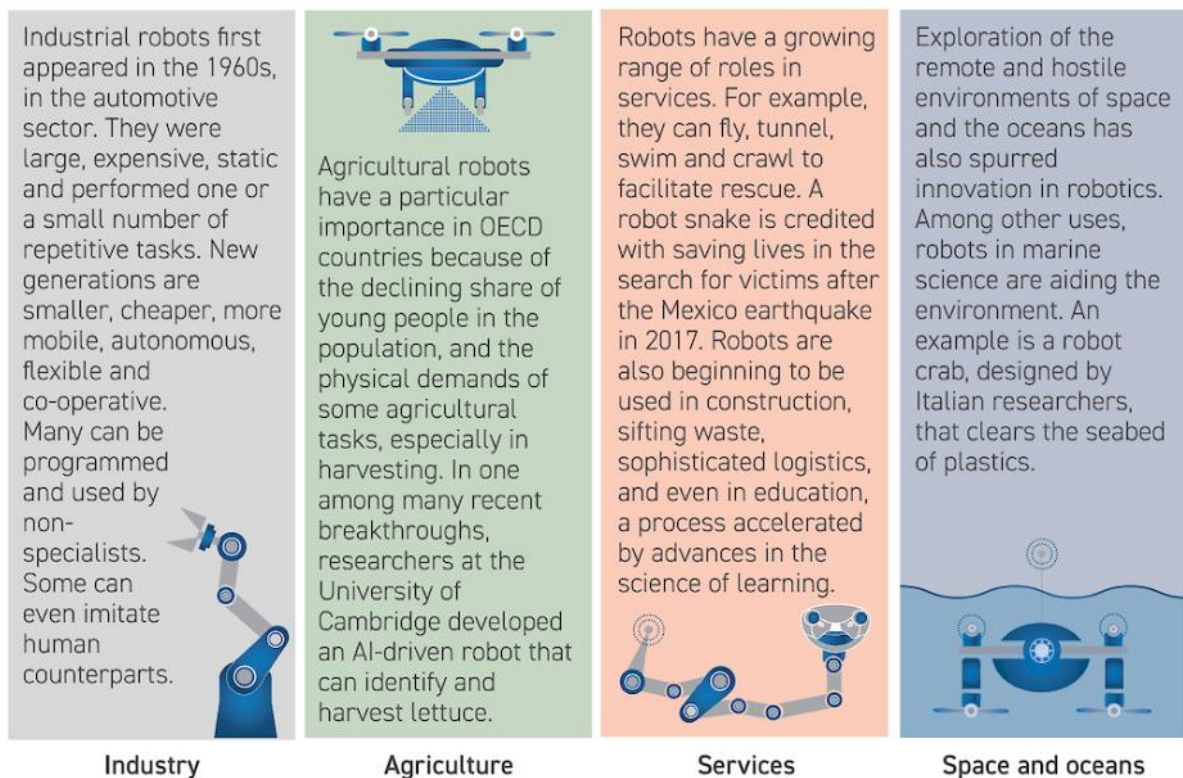
Figure 3: *Current and emerging robot applications span the economy. Source: OECD Science, Technology and Innovation Outlook 2021, Times of Crisis, and Opportunity.*

It is common to see within businesses the HRM policies which purport to create a dynamic working environment, provide intrinsic and extrinsic motivational benefits, and show that the growing staff numbers are a sign of corporate success. The reality is that a business is driven primarily by profit and will seek to maximise the methods in how to achieve this else they will be uncompetitive and fail. During the Covid-19 pandemic many dynamic workplaces were ignored for the alternative home working, no longer flexible working on the companies but the workers terms. Seeking to recover technology investment to allow workers to work from home whilst having to pay high rents in parallel some companies sought to remove travel allowances (BBC, 2014). The debate is strong in the present day with members of UK government stating that workers should return to the office (BBC, 2014).

What will companies make of technology advancement and implementation versus the human workforce especially of they are already lower paid workers. Will they implement policies to ensure motivation altruistically for employee wellness or will they seek to digitally transform to ensure full automation?

There is a gap in the quantum of research relating to HRM models and frameworks for the introduction of advanced Industry 4.0 technologies into their workplaces. The classical and contemporary frameworks of reward management practices do not prepare for the future

workforce and the future of work. This may be because the HRM department itself is under threat from technology hence they themselves may be demotivated or less inclined to support a company which is reducing the workforce. HRM and IT teams within organisations need to work in sync to ensure digital transformation is realised and human values and motivation are not left out of the strategy. Finally, they need to ask is it ethical to introduce the more advanced Industry 4.0 technologies such as AI, Machine learning and computer vision or should they be advocates of governmental regulation.

6. RESEARCH METHODOLOGY

6.1 Introduction

The purpose of the study was to establish if introducing new advanced technologies into a workplace may lead to a devalued workforce than before its implementation if not planned and managed. The study sought to assess if classical or contemporary business models or frameworks related to innovation and reward can be applied to the introduction of new advanced technologies to prevent demotivation. The broad aim was to propose a new framework that would be suitable for implementation by HRM departments within industrial environments. This will further the understanding of risk to business if technology projects are implemented without proper planning. The study used thematic analysis (Braun and Clarke, 2006) which is discussed in detail later in this chapter. Qualitative data has been gathered using primary sources via interviews with industry specialists. This chapter also focuses on the research rationale, sample data, data analysis and limitations/delimitations of the study.

6.2 Rationale for Research Approach

The researcher considered the approach of Thematic Analysis. According to Braun and Clarke, (2006) it is a method for identifying themes or patterns within qualitative data. It does not require quantitative data to support it. The rational is by using semi-structured interviews as conversation topics the important themes within the interview texts emerge. The theory has three main steps known as 'the method,' it requires the coding of text following data collection, memoing it and theorising before integrating, refining, and writing up theories. A thematic map was developed because of coding the interviews. The researcher did not intend to conduct a constant comparative analysis which may cause the interviewees to be contacted more than once as new themes emerge whilst conducting later interviews. The researcher also considered grounded theory (Glaser and Strauss, 1967) however was discounted as this is best used when there is no existing theory or when the theory is too abstract. In this study there is already a body of literature which discusses the theory of introducing advanced technologies into the workforce and whether motivation or demotivation may occur, this was the basis of the literature review chapter.
Using Thematic analysis does not require the repetition of coding and data collection and is generally suited to test existing theories or retest these within a new context (Braun and Clarke, 2006). The literature review chapter of this research describes how the existing theories such as Maslow, Vroom, Expectancy etc may be outdated when considering new advanced technology which is still in the process of technological development and may

change the workforce considerably. Thematic analysis was best matched with this research study.

6.3 Research Setting / Context

The researcher has worked in the aviation engineering technology industry for 20 years, holds a BSc (Hons) in Building Surveying and has undertaken the design and implementation of innovative technologies into major airport environments across the world. There is no conflict of interest between the researcher and the interviewees, they are not professionally engaged in business contracts. The researcher has first-hand skills in innovating new advanced technologies and discussing these with industry experts. The researcher is a Chartered Engineer and a member of the Chartered Institute Engineering and Technology and the Association of Project Management.

The researcher focussed on the aviation industry as this is a well-known industry to the researcher and enabled ready access to interviewees. The aviation industry contains distinct operational environments which are heavy in manual labour such as catering, cargo, ground handling services. The broad aim of the research is to propose a framework for the HRM department to use when considering the implementation of advanced technologies. The study of one or more of these areas to develop a HRM reward framework should be equally applicable to the other airport operational areas and general industry.

6.4 Research Sample and Data Sources

The sample of interviewees was predominantly from an aviation industry career background with varying specialisms such as airport cargo operations management, ICT programme management, aviation systems strategy and innovation, cyber security and airport operations management, aviation systems design and human resource management in major airports. The sample all had industry expertise greater than 15 years in the profession, they were located at various geographical locations such as UK, US, Germany, Netherlands, Qatar, and Oman. All participants were fluent in English, yet this was their second language. All participants held a minimum of a first degree and some further master's degrees in their professional field. The participants came from the researchers own professional network.

Initial contact was made by email to state the intention of this study and a follow up video call was conducted to further set the parameters of the interview. The participants in the interview were asked to respond to a number of set questions over a telephone or video call. There was also opportunity for free-flowing conversation regarding the future of advanced

technology, the timescales by which these may be implemented in the industry and how they perceived the motivation of the workforce may have reacted to previous advanced technology implementations and how this could be improved upon.

Demography of the interviewees was not seen as a factor in study however the sample was from both men and women ranging from 40-60 years old. The justification for this age range is that the age group will have had multiple experiences with implementation projects whereas younger interviewees would only have a limited breadth of experience to choose from. A consent form (Appendix A) was issued and returned via email prior to the interview.

6.5 Data Collection Methods

Primary Data: The sampling technique was to conduct interviews (non-random), the sample size =6. The interview questions are contained in Appendix B. The interviews were recorded using the electronic Microsoft Teams platform which were later used for playback and analysis. The interviews were a semi-structured format and time was allowed to probe deeper into any interesting insights the interviewees touched-upon to enable a deeper understanding. This also allowed for hypothesis testing and identification of variables which may be involved in the introduction of advanced technologies and motivation. Video interviews were selected as the most appropriate method due to the geographical distribution of the interviewees. All interviews were anonymous, data is stored offline. Each interview was a single session. The interviews were electronically transcribed using Microsoft 365 Edge tool for automatically transcribing audio to text. Roulston (2010) identified 3 types of research interviews, 'Neo Positivist' where the researcher has a neutral role and avoids bias, 'Romantic' which utilises empathy with the interviewee to elicit self-disclosure and 'Constructionist' in which the interviewer and interviewee co-construct through unstructured and semi-structured interviews. This research used the Constructionist type of interview as this was best placed to develop qualitative feedback which sought differing opinions from the interviewee and a broad understanding to the researcher.

Secondary Data: Industry journals, namely Passenger Terminal World Today and Airports International dated between January 2019 and June 2022 were used to identify the advanced technologies and trends in airport implementation. The journals were personally sourced by the researcher through monthly subscriptions. The journals summarise the industry's aviation projects, what they set out to achieve and importantly the technology to be introduced. The criteria were to search for keywords which have been listed in Appendix C. These keywords will function as an aid memoir to provide context to the interviewee.

6.6 Data Analysis Methods

NVIVO software has been used to code the transcripts. The functionality of the software was used to group the sources (interviewees and journal text) and develop coding to organise the data. Containers were used to collate aspects of similar data. The software was used to look for key words, the strength of words in terms of emotion and develop word clouds and word relationships. Gray (2018) identified three types of coding: Topic coding to ascertain the main theme, Analytical coding to establish what the content is about and Descriptive or Case coding to note who was speaking and the story of what happened. This research used all three coding types.

6.7 Issues of Trustworthiness

According to Eli et al (2014) from the validity perspective, it is important to report how the results were created, that the analysis and conclusions can clearly be followed. They describe inductive and deducted techniques for qualitative research. Inductive is more suited to content analysis when the raw data is not supported by traditional frameworks, models, or theories. As this research does not have underpinning theory then the inductive approach is most suitable.

The internet was not used as a source of data in this research. According to Rice et al (2017) which specifically addressed internet-based research within the aviation industry there are many disadvantages such as 'unrepresentative samples, lower response rates, financial motivation issues, non-behavioural data, and lack of follow-up data'. The interviewees are known in their field in the aviation industry and this builds upon the trustworthiness of the data to be gathered. The data when gathered will be transcribed automatically electronically and then parts of the audio file will be checked against the transcript to ensure completeness and accuracy. The researcher did not steer the conversation to any biased conclusions, the conversations were open minded and accepting that others have differing viewpoints, experiences and perspectives relating to their own career history.

It was important to the researcher that the interviewees are not solely from an academic background. The research aim was to study the effects of motivation and reward. This requires a personal knowledge of technology change projects which only comes from practitioners.

6.8 Limitations and Delimitations

According to Monique and Bonnie (2020) saturation is a core principle in qualitative research used to determine when there is adequate data to develop a robust understanding.
The sample size was small however it would not be anticipated that the addition of a greater number of interviewees would have enhanced the understanding of advanced technology implementation. The interviewees were specifically selected due to their lengthy experience in their profession. The research is limited as it is focussed on the aviation industry for convenience as this is the industry the researcher is most familiar with. Parallels between aviation industry and other transport or non-transport markets may not easily be made although the themes will be remarkably similar. To reach saturation, at least in the transport market, the research would, in the future, need to be conducted across the road vehicle, shipping/water based, railroad sectors. In some niche sectors such as electric scooters, autonomous driving vehicles the research would be limited as technological advancement initially sets out to remove the workforce to become more efficient. When considering dependability and whether the findings may be the same in the future if the same data set were used this will be partially limited as the data will be destroyed at the end of 3 years. However, the pace of technological advancement, retrospective analysis of change projects and current societal issues generally make impression on interviewees, for instance if their last project was a success or failure this may taint and colour the responses.

6.9 Ethical Considerations

According to Bhandari (2022) Research ethics matter for scientific integrity, human rights and dignity, and collaboration between science and society. The researcher for this study submitted an ethical approval form to the university and was subsequently approved. The anonymising of data, both interviewees and companies, was included in the consent form to the interviewees. Name of individuals will only be known to the researcher.

6.10 Research Methodology Summary

One aim of the research methodology is to demonstrate how the research was undertaken in an ethical manner, this was fulfilled by the consent form (Appendix A) and the acceptance by the interviewees prior to the interview. It is recognised that the research will have certain limitations once the interview data is destroyed and that the research is limited to the aviation industry and therefore may not be readily portable into other industries for comparison.

As this is qualitative research NVIVO is the most appropriate software to develop the coding of the data. The interviewees were from a mixed age, sex and career background offering a broad insight into their previous technology change projects and their thoughts on motivation and interaction with HRM departments. Thematic analysis is the most appropriate for this qualitative research.

7. PRESENTATION OF RESULTS AND FINDINGS

7.1 Introduction

6 online video interviews from airline technology experts (respondents) lasting approximately one hour each were conducted. The methodology aimed for 7 interviews however one interviewee was unavailable. This did not affect the research compilation and findings. The videos were transcribed into text using Otter.ai software and uploaded to NVIVO software for analysis. The purpose of the interviews was to establish the views from the industry towards the introduction of advanced technologies into the workplace, whether this has a de-motivational effect and if the HRM department could utilise a framework for technology project implementation.

All respondents demonstrated a knowledge of advanced technologies and were able to describe first-hand experiences of how major technology projects have been implemented. Respondents' names have been omitted from the transcriptions and been referred to as 'R1' through to 'R6' for convenience.

7.2 Thematic Analysis and Key Findings

4 main themes emerged from the interviews. 'Themes A – D' have been described in this chapter only briefly to provide context along with the initial findings from each theme. A fuller analysis is provided in the following Discussion chapter. NVIVO produced a word cloud which demonstrates the most frequent usage of words used in the Interviews. This has been shown below and the most dominant references are to people, technology, jobs, change and the workforce. The word cloud was not particularly insightful for this research as it did not lead to any particular understanding of the themes. It represents only the quantity of instances which particular words were used in the interview conversations.
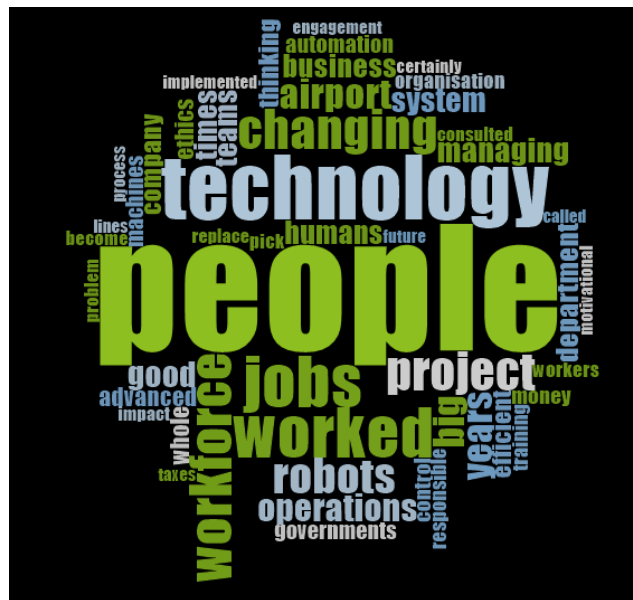
Figure 4: *Word Cloud, NVIVO Software*

A further analysis was undertaken using NodusLabs software to produce a connected word to analyse how the frequency of words are used together. This has been shown below and was also not very insightful., instead the research focused on thematic meaning.
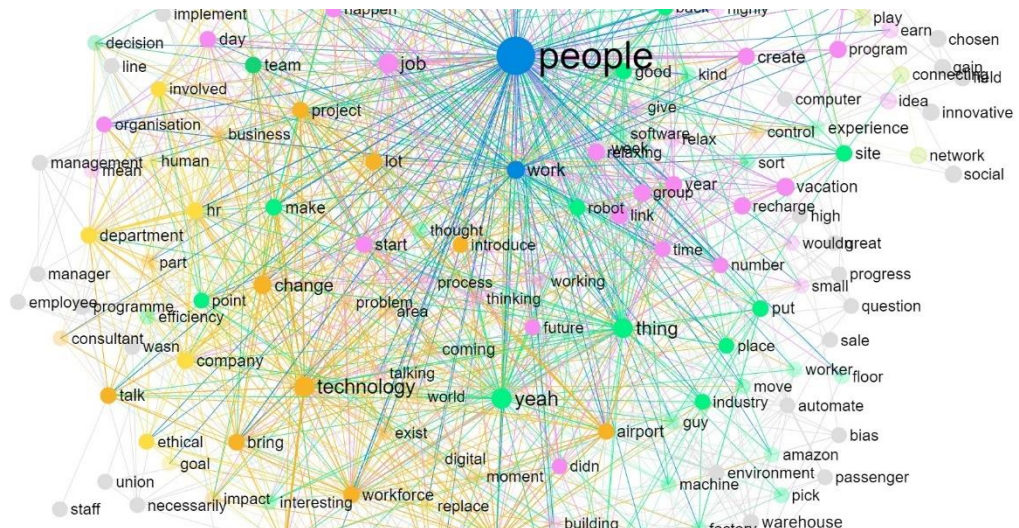
Figure 5: *Connected Word Cloud, NodusLabs Software*

7.3 Thematic Analysis Map

A thematic analysis map has been created which identify the patterns of conversations held with the interviewees. These represent the 4 main themes which were identified.
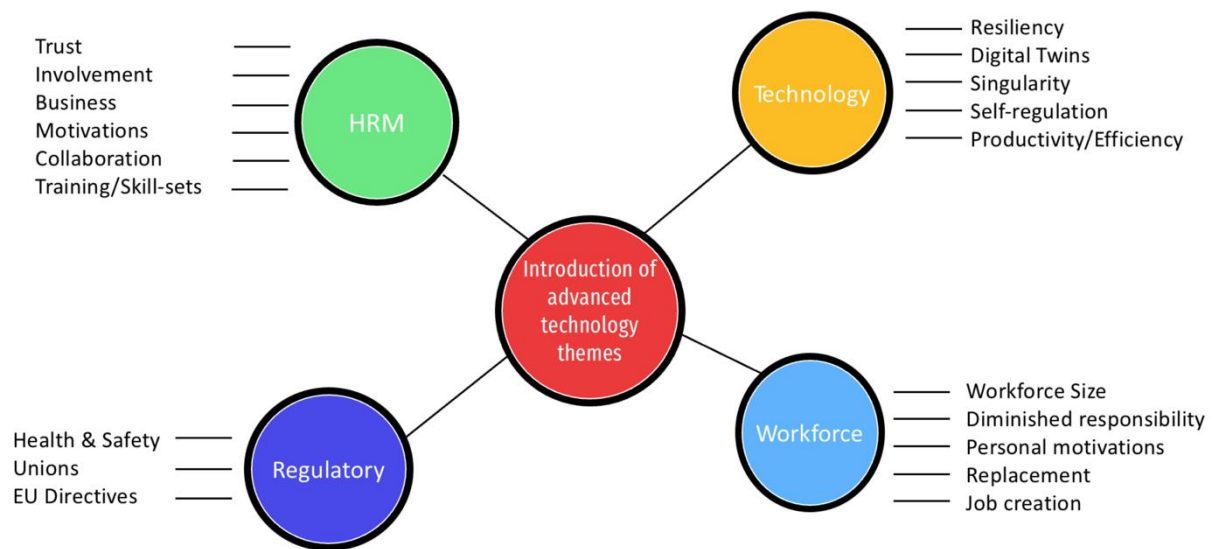
Figure 6: *Thematic Analysis Map*

7.4 Theme A -HRM

All respondents described that the HRM department was not typically involved with technology implementation projects. R1 stated that 'HRM are not involved in any sense' and R2 started with stating that they had an extremely negative view of HR departments in technology projects in that individuals have trust issues in HR dealings. There is a perspective obtained from the research data that the objective of HR is to minimise labour costs and drive high productivity. There was a general agreement that although there was a distinct lack of HRM involvement however and there was a need for the workforce to be considered and protected it was not unanimously agreed at the start of the interview that it should be the HRM department themselves which should be involved in doing this. R4 recognised the conflict with HRM and business strategy and stated, 'I think it's very difficult for the HR department because they're trying to work with the business strategy, which is to make as much profit as possible'. R5 supported this and stated, 'The HR kind of align themselves with the strategic goals of the company'.

Respondent R1 stated that when a particular advanced technology was introduced which personally affecting their work, they saw it as a demotivation, and they delegated the work as a result. They stated 'Well, I didn't actually do it. We had more junior people on site who were allocated with that particular task.' R1 also envisaged the motivational opportunity of technology even when the human workforce is replaced and stated, 'everyone's standard of living increases by virtue of the fact that you've got machines doing all your jobs for you'.

7.5 Initial Finding A

The initial finding is that HRM is not involved with the implementation of projects and that they are perceived negatively when considering their involvement with project related work. The respondents agreed that the best point of interaction, should HR be involved in future projects, is at the inception stage. Another initial finding is that the technology can be both motivational and de-motivational and that larger societal questions needed to be considered if humans were replaced by advanced technologies.

7.6 Theme B - Advanced Technology & Future Viewpoints

The respondents were all able to discuss advanced technologies ranging from building management systems to robotics however there was a cautionary tale such as that from R3 who stated 'I think in this whole thing is that in decentralised systems, you have more resilience. The more you centralise, the more, you create single points of failure and potential catastrophic failures, if something really, really bad goes wrong.' There was a theme of lack of resiliency in computer systems and an acknowledged fear that computer software is not capable of managing a crisis or disaster situation. Digital Twins are an evolving technology, and all respondents were able to envisage their likely use cases. It was generally thought that these were a steppingstone to robotic autonomy removing the need for the maintenance workforce in the built environment. There was general agreement that the future will involve the deployment of greater amounts and advances in technology which will seek to diminish the role of the human workforce. The topic of the singularity and artificial intelligence was an interesting viewpoint with each respondent demonstrating differing views on whether an advanced technological computer or robot could ever replace the workforce to such an extent that it leads to societal breakdowns.

7.7 Initial Finding B

The key finding is that greater implementation of advanced technologies may have detrimental effects on not just the human workforce but also create issues when the system fails and that humans traditionally have that responsibility to ensure resilient systems.

7.8 Theme C – Positive and Negative Views of Advanced Technology

Each of the respondents were able to describe what they saw as positive or negative about the advanced technologies and this produced some nuanced discussions. R2 said that he they had a positive view of technology when it reduced accidents or had health and safety

advances such as using exoskeletons for manual handling of airport baggage. R6 had the view that some technologies were introduced for a company's benefit and not the employees. They stated, 'I don't think it was so much the health and safety, I think it was about them making a statement to be cutting edge in the industry.'

7.9 Initial Finding C

The views on whether technology was a positive or negative produced a general view that the implementations were for the companies benefit and not the employees. When the health and safety of the workforce was mentioned, this was seen to be in response to government legislation and that companies were forced to make technological improvements. The key finding is that the technology can be both negative and positive for the human workforce.

7.10 Theme D – The Workforce

There was a consensus from all respondents that the number of human workers in the industry would diminish over time when a technology is introduced however the respondents also stated that the introduction of technologies may also cause the number of workers to increase. For instance, R5 stated that the quantity of human workers would diminish and that would also apply to new technical challenges 'we would remove all of these bottlenecks by adaptation, not necessarily by bringing in workforce'. Other respondents held the view that innovative technology created additional jobs and that there is a natural balance in the size of the workforce, it will not diminish in the near future however the respondents were less likely to have this view when considering technology which may be available in the 30–50-year timeframe.

7.11 Initial Finding D

The key finding is that the numbers of workers will diminish for a like for like manual labour job and in some instances the highly skilled workers may be retained but their responsibilities may be less than before technologies were introduced.

7.12 NVIVO Sentiment Analysis

NVIVO produced a sentiment analysis of the respondents' transcriptions using auto code. This is in respect of sentiment towards advanced technologies being motivational or demotivational.

This has been included below. It shows that there was neither a strong positive or negative sentiment of the transcriptions with 23 positive and 21 negative sentiments.
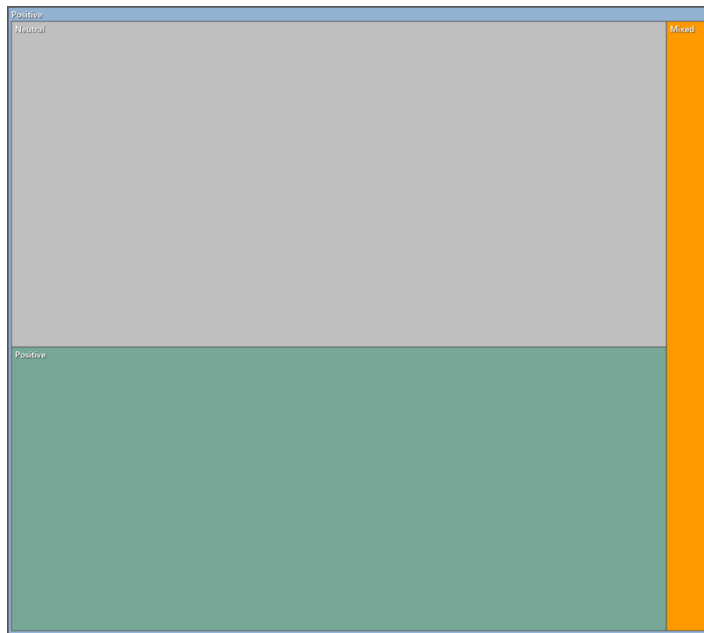
Figure 7: *Sentiment Analysis, NVIVO Software*

7.13   Results and Findings Conclusion

The interviews demonstrated that the themes from the respondents were broadly in line with the literature review in that the future human workforce is at risk, there is a continual advancement in the pace of innovative technology which can remove or alter the workforce of the future. This aligns with Tegmark (2017) that stated the whole bottom of the job pyramid was at risk. There was a consensus that the HRM department should have a role in the organisational preparation for innovative technologies especially when this would result in demotivation of the workforce through diminished responsibilities. This aligns with Bradley (2022) who recognised that the HRM department has a significant role to play to ensure employee resistance is overcome.

8. RESEARCH DISCUSSION

8.1 Introduction

The research produced data which has been categorised around the four themes in the result and findings chapter. This chapter makes sense of the findings by reviewing what was expected by the research literature versus what the interviewees said and if they had any opposing opinions. The findings are interpreted according to the original research question which was: Does the introduction of innovative technology in a workplace lead to negative outcomes such as workforce demotivation and longer-term societal issues? The research had an aim to propose a HRM Framework for Implementing Advanced Technology in the Workplace.

8.2 Human Resource Management (HRM)

8.2.1 HRM Involvement in Technology Projects

The discussion on HRM flows from Theme A in the results and findings chapter. The research enquired if the HRM department participated in the implementation of technology projects. The data showed that there was an anticipation that there would have some departmental involvement no matter how minor. All participants were clear that there was not any involvement by the HRM department in their experience. This supports the theory that the HRM department ignores the topic of automation (Stein & Schulz, 2020) and this leads to difficulty in technology adoption. This was an unexpected result and revealed that a deeper study may be required into why the HRM department is not involved.

One participant said consultant companies sometimes offered engagement with HRM as a service but was frequently turned down to save costs. The data showed that the participant's had a similar view that HRM departments are not technically skilled and not adequately trained in either project implementation or in technologies to be able to offer a meaningful input. They expressed that the reason IT consultants were brought on board was to bridge this gap in implementation however it was not the consultant's role to understand or assess the workforce impacts and undertake preparation for new working methods or training. It was recognised that these gaps were typically undertaken by other 'operational readiness' consultants.

The participant's all had experience of IT project failure from the perspective of operational readiness (OR) and recognised that there was a lack of preparedness in organisations to marry the technology project with the workforce. The data showed that the participants

shared a view that technology consultants are brought into a project at the last responsible moment and not the beginning. The typical outcome in these projects were normally extended project timelines and initial underperformance of the technological solution. Bondarouk & Looise (2005) said that all IT innovation implementations within organisations are widely acknowledged as turbulent. The research infers that one of the reasons is that the workforce is underprepared for change is that there is no organisational group which is responsible for communications and preparedness actions with the workforce from the outset of the project. The data did not show that there was any HRM framework which has been used for the introduction of innovative technology.

8.2.2   Trust in HRM Departments

The data showed that there was a mistrust by the workforce of the HRM department and highlighted examples of personal previous dealings. The common theme was that the HRM departments primarily contacted the employee to discuss revising benefits packages and redundancies. The conversations with the HRM department are therefore guarded and one-directional in that the employee feels that they should always demonstrate to the HRM department that they are fully or over utilised in terms of working hours and adding more value than their role description requires by undertaking additional responsibilities. This demonstrates an extremely negative relationship between the workforce and the HRM department. Bradley (2022) recognised that HRM has a role in technical change projects and to avoid employee resistance. For the HRM department to overcome employee resistance it would be required for the HRM and the employee to first have a level of trust and a positive relationship which can be built upon. Agolla's competency model (2018) for HRM was not witnessed to be used on any of the participants previous projects.

8.2.3   HRM and Workforce Motivation

The research enquired if advanced technologies could lead to a demotivated and devalued workforce. The context of artificial intelligent robotics and machine learning analytics was used to describe some use cases such as airport cargo, catering, and baggage environments as these are traditionally extensive in use of manual labour. The interviewees all foresaw a future time when the workforce would be fully or partly replaced by such technology. One respondent stated 'So those types of jobs I think, are getting better and more and more skilled, but a lot of the more repetitive tasks are disappearing.' The views ranged from the positive impacts of technology such as giving the workforce more leisure time, the operational department heads more information and the organisation an

always-on workforce that was highly efficient and did not need to sleep to the negative such as a lack of personal worthiness if in the transition period to full automation if the diminishing size of the workforce had to manage machines all day, every day with little or no other human contact.

There was clear sentiment that all employees in a company should feel valued by their organisation, suitably rewarded in renumeration have a work-life to leisure balance but importantly be respected within the workplace by their peers for the role that they perform. The interviewees did not know of any organisation who would act in this way to ensure the protection of the workforce. Hawking (2014) stated that artificial intelligence was the most important conversation of our time, however, it was viewed that the conversation is not yet occurring at the organisation level although it may be occurring at a national regulatory level.

8.2.4   HRM – Their Role in Collaboration, Training and Skill Sets

The research queried how the HRM department could add value to technological change projects the participants expressed that early engagement would be a benefit to prepare the workforce of the future changes. The expressed that this should be regular throughout the project to bring the workforce up to speed with project outcomes and timescales. It is not typical for HRM personnel to be technology aware. One participant suggested that as a potential enabler of a project's success that they should undergo regular training on technological developments. This would provide a benefit to reduce the knowledge gap between internal departments and external consultants. A better-informed workforce with HRM acting as a bridge on technology projects may produce a better outcome for technology adoption. One respondent described this as a benefit which may help unionised workforces in that all departments and the workforce could speak the same technological language.

Participants gave examples of failed technology projects were the workforce either refused to use the innovative technology or were informed not to use new systems by unions. The inference is that the workforce avoids participating in the usage of innovative technology due to their lack of knowledge about the project, the technology, the business benefits, and the impact personally to the individual. Bradley (2022) recognised that it was important for HRM to be involved to limit employee resistance however this is clearly not the norm.

8.3 Advanced Disruptive Technologies in the Workplace

The discussion on advanced technologies flows from Theme B in the results and finings chapter. When considering advanced technologies, either existing or developing, the participants highlighted those which they thought may have the greatest impact on the number of employees in the workforce. Robotics was mentioned as having the greatest impact as this directly emulates the actions of human beings. The typical areas of application are within environments where there is repetitive effort such as a cargo preparation terminal, airport baggage processing, cleaning, and non-airport environments such as brick factories, fruit picking. Robotics was viewed as a positive technology as it provided a health and safety benefit to the workforce who would not have to lift and twist all day. The drive to replace the human workforce with artificially intelligent (AI) robots was announced by Tesla (2022) who seek to have robots initially within their workplace then spreading to millions worldwide.
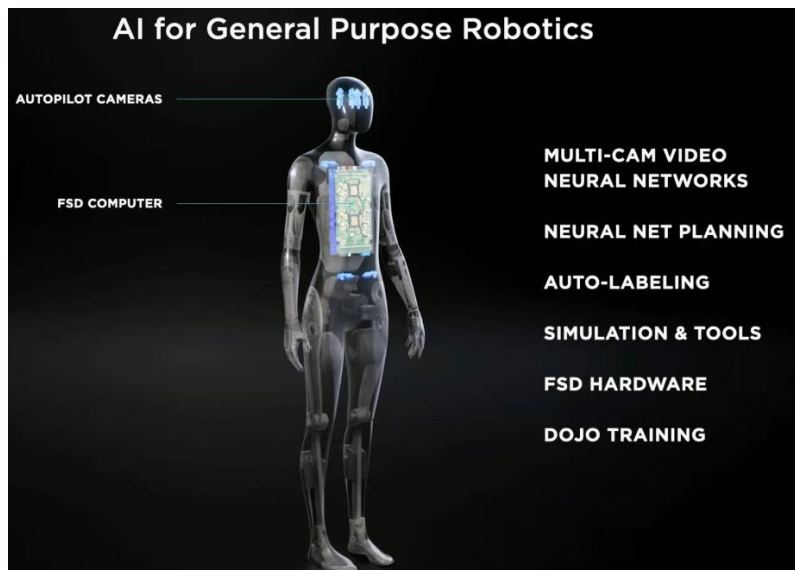
Figure 8: *AI for General Purpose Robots, Called Tesla Bots or Optimus Bots. Source: CleanTechnica.com, 2022.*

The research data did not support a definitive view of when AI may replace sections of the workforce, and this could be the subject of further research. Dafoe et al (2018) predicted that AI will outperform human drivers by 2027, retailers by 2031, surgeons by 2053 and all jobs will be eliminated within 120 years.

Virtual air-traffic control towers using centralised control systems were also seen as a disruptive technology in that they also reduce the number of workers overall but eliminate the need altogether for humans to be based at every airport. The development of digital-twins technology coupled with the sensor input from the Internet of Things (IoT) provides

new insights into how physical environments are performing. This technology was not initially as not considered as one which directly causes in the reduction of the workforce but when it was discussed and considered along with, dashboarding monitoring and algorithms it was clear that the output of the digital twin would be drive maintenance teams to the best possible efficiencies and therefore reducing their numbers. One respondent stated, 'So those types of jobs I think, are getting better and more and more skilled, but a lot of the more repetitive tasks are disappearing.'

3D Printing of construction elements either in whole, such as a foundation/wall structure or in part such as a modular structure was seen to be a disruptive technology that would change the workforce numbers in construction environments. The participants held the classical view, such as Ordana (2021) that the workforce impacted would be retrained on new digital trends and find work elsewhere.

The data showed that AI was an extremely disruptive technology, and that people may not realise how it works. One participant stated that the previous method of working out new software was 'to talk with someone for a long time, work out thew rules and how they apply using their experience which depends on the quality of people you talk with whereas a good AI system will just learn how to do that job pretty quickly and that will be baked into most operational type roles'. This aligns with the views of KoprnFerry (2022) who said that companies ignored 'individuality' at their peril and that employees want to feel that their approach to work can be individually tailored. This supports the research that HRM needs to be involved in technology projects and support the process of change.

8.3.1   Systems Resiliency versus Humans

The participants clearly recognised the advanced technologies and their disruption ability however some mentioned that precautions should be taken to ensure that humans are not removed from a workforce process altogether. Systems resiliency was seen as a necessity in all workforce environments. The interviews discussed that in a moment of crisis that humans would always, at least for the near future, know how to deal with these situations better than computer systems. The timing of when a singularity may occur, when such systems may never need human input in any situation was not agreed upon by the participants.

The advancements of the last 50 years indicate that there is a prolific amount of technology options which companies and individuals can choose from to undertake their jobs however

no participants wished to estimate a timescale (Tech Trends Report, 2022). All but one participant seemed unaware of the effect a singularity may have on society and the societal issues which may be caused by eliminating the greater amount of the workforce. The researcher explained the singularity scenario and what the possible outcomes may be, and this is a limitation in the research as only the researcher views are considered therefore bias opinions may be present in participants answers when societal issues are discussed such as taxation, leisure time, sense of employee worth.

The views of the participants initially matched the view of Nunes (2021) which was that automation just does not create or destroy jobs, it transforms them. It was through discussion about the singularity that the participants recognised a greater risk to the workforce than previously thought. The participants acknowledged the view of Borchowsky (2019) that classically held views that technology could not create long term unemployment.

8.4 Workforce Productivity and Efficiency

The discussion on the workforce flows from Themes C and D in the results and finings chapter. The data showed that all participants understood that the goal of non-charitable companies was to generate profit and maximise stakeholder returns. The drivers for companies undertaking digital transformation projects were mentioned by all participants and involved themes such as undertaking tasks with greater speed, less human interference in processes, reducing utility or material costs, overcoming inefficiency. The participants stated that the covid pandemic may have accelerated the drive by companies to become less reliant on the workforce as a crisis highlighted that humans cannot be relied upon. This is supported by an industry report which states 60% of 475 surveys within the IT profession believed they expected their organisations to see either a lot of change or transformative change following the covid pandemic (Tech Trends Report, 2022). The participants discussed the difficulties which European airports in mid-2022 faced when attempting to mobilise a workforce to support the increasing flight numbers. It was stated that particular job roles such as security search, cleaning, check-in, boarding could all be automated and the need for large workforces reduced.

There are two limitations in the research as all the participants were from the airport industry and their opinions may not be reflective of other business types. This reflects the view from M et al (2019) that to survive an organisation must seek to maximise efficiencies and Ford (2015) who said that most jobs are routine and are therefore at risk.

Nunez (2021) estimated that technology will create twelve million more jobs than it creates by 2025. The participants were from a higher middle class socio-economic background in professional consultancy roles. It is inferred by the research that those in professional job roles may be unaware of the impact technology is having to lower socio-economic groups undertaking manual labour roles.

The data shows that the introduction of advanced technologies may have a beneficial and motivational effect for a section of the workforce when technology provides a health and safety benefit or when it provides additional data to the worker to take more control of a systems process. The data shows that there may also be demotivational concerns however it did not show clearly that there would be societal issues as a result.

8.4.1 Workforce Numbers and Satisfaction

When considering the workforce and the participants experience in implementing technology projects there was opinion that the greater the number of departments levels interfaced with during a project leads to additional 'red tape' and is preventative from having a streamlined implementation project. Conversely, the opinion was that the same workforce should be retrained to maintain and program robots but that this is always beyond the scope of a technology consultant. The participants recognised that the workforce who are not fortunate enough to be retrained and take on new related jobs within the same workplace would have to retrain and seek jobs elsewhere.

One participant cited the example of the workforce in the aviation industry having to retrain as delivery drivers during the covid pandemic. The data showed that although the overall number of people in the workforce may have been reduced by the end of pandemic (Trading economics, 2022) the quality of the jobs was not similar as there was a rise in the number of gig economy workers (TUC, 2021). According to Oxford Internet Institute (Fairwork, 2021) there is a reduction in workers quality of pay, conditions, contracts, management, and fair representation.

The data showed that all participants recognised that workers who remained in the workplace once a highly advanced technology has been introduced, such as robotics, would have negative motivational and sense of personal worth concerns. Such concerns were represented as a worker's lack of ability to continually converse with colleagues and discuss shared personal experiences, diminished sense of personal worth as workers may not be fully utilising their thinking and logic skills, believing that they are a stop-gap solution until

future technology also replaces their own role, lack of personal fulfilment and ability to nurture, train and mentor others. Cumulatively this leads to a loss of workers personal job satisfaction. The data showed that one participant had a personal experience of interacting with the workforce to define systems process requirements for new advanced software. The workers would request that the new software to have the same functionality as the existing process and that their usage of the new software would be the same as the old. It is inferred that there is a reluctance to change their working methods as this may lead to a simplification of their role.

The data also showed that innovative technology was not implemented with the end-goal of reducing employee numbers but to provide a systems platform which the workforce could use to increase productivity and output without requiring more manual labour in the future.

8.4.2   Workforce and Society

Data was gathered on societal issues which may be created because of workforce decline in numbers and in quality. One participant stated that 'your workforce is the customer base which your workplace is servicing' and 'when we start automating the base disappears and it is the death of the welfare state.' This infers that the workforce buys the goods or services of the workplace and pays taxes to be spent by government. When this link is broken there is not enough money to maintain spending plans which in turn means less money for consumers to spend on goods.

One participant noted that this may lead to a 'reverse train of emigration of UK workers' to other more economically successful countries. One participant said that 'automation or techno-change in technology is inevitable and the workforce has always found something to do which is a better skill level than the previous generation. In five years, we may have jobs that never existed before but if the decision makers in the government of today are not equipped to oversee change, then they are not engaged in having the big conversations.

Another participant said that 'the governments do not take decisions and that is a fundamental problem in society, even if people are supported financially and they don't have meaningful jobs that they feel good about, eventually they will revolt.' These views align with the view of Phobe and Moore (2019) who queried why introduce technology at all and is it humane to introduce technology that creates problems for humans and society. It is inferred by the research that HRM is not engaging with the conversations of technology implementation therefore they are also not asking themselves the ethical questions to

determine if the companies' projects increase or decrease the conditions for the workforce and society. This is the question which was also asked by Tegmark (2017) which asks if we are making ourselves obsolete. The data also supports the view of Omar (2010) who noted that HRM departments when scored against challenges of the future chose change management as the lowest challenge they were concerned with.

8.5 Regulatory Concerns for Implementing Advanced Technology

The research gathered opinions on whether government should be involved with the creation of legislation or at least guidelines for companies to follow regarding technology advancements in the workforce. The opinion was that 'government needs to stand up and have a lot more responsibility' and there should be an ethical charter for the automation of robotics. It was noted that there was a view that companies may already have ethical charters however they are for media soundbites, and they do not really care about the workforce.

One participant, when discussing job redundancies caused by implementing innovative technologies, gave an example of how major companies first outsource a number of repetitive roles, then they seek maximum efficiency from the outsourced company who in turn implements technology and makes redundancies. The major company is not seen to be making the redundancies and now have the option of bringing the service back in-house later. It was stated that any regulation should be one-for-all regulation and not that one single country should disadvantage themselves. There was an opinion that the workforce may always be suspicious of HR and that unionism may provide the answer as they are seen to be always working in the interest of the worker.

Another participant viewed regulation for advanced technology as possibly becoming part of the UN sustainability goals and that companies would seek to measure and publish their own performance as it may lead to greater investment and provide positive public relations media.

Cautionary opinions were given in the research that even if legislation exists the companies and their boards still 'get away with it,' meaning that they do not necessarily follow what government may mandate. Similarly, there was concern that if a point of singularity were reached, a self-aware machine would be 'a great risk to mankind and the planet.' In this case the technology should be regulated using the Isaac Asimov (1941) laws of robotics which could be used within the legislation. This is supported by the Artificial Intelligence

Cooperation (2020) which stated that we need to work cooperatively with AI systems and do not give them the power to make decisions which affect us. Kissinger et al (2021) also shared this view that regulation is required to counterbalance AI and protect workers.

The data is supported by Alice Xiang (2022) who said that 'as AI becomes increasingly integrated into our everyday lives, technology companies must reflect on how they are parenting it'. Startingly, a study by Alfonseca et al (2021) said that humans may not be able to control superintelligence because it is multi-faceted and 'capable of mobilizing a diversity of resources to achieve objectives that are potentially incomprehensible to humans'. An additional concern is advanced technology bias. Machine Learning (ML) computers use algorithms to search for historical patterns in data, typically from a dataset collated over many years within a company or the internet. Technology based on ML will unknowingly take on any bias within the data. This research is supported by Christian (2020) who described machines, however intelligent, as inherently discriminatory.

The research may be limited as it has not gathered first-hand data from regulatory bodies such as the UK government or EU. This may provide an additional lens from which to determine if there are plans to provide companies with guidance. The meaningful conversations on advanced technology and societal issues are only taking place within special interest groups and technology authors.

8.6 A Framework for Implementing Advanced Technology in the Workplace

A HRM framework has been proposed below. It has three high-level themes. The first theme is Training & Business Strategy. HRM departments can seek to resolve the concern of a lack of trust from the workforce by undertaking training in the technology available in the industry and the roadmap for new advanced technologies. Equipped with this information the HR department can start to engage the workforce in meaningful conversations around the future of work and processes. This will provide useful insights and competitive advantages when the business strategy is revised. The information, gained from workforce feedback and measurement, can also provide additional marketing and promotion material.

The second theme is Digital Project Implementation It contains the HR involvement with digital transformation change projects. At project inception the HR department can become a project stakeholder and represent the workforce to the project consultants. This will give a voice to the workforce. The HR should seek to ensure the consultants gather project requirements by communicating with the workforce representatives to ensure innovative

technology is designed to be unbiased, human friendly, ethical and balances the productivity between humans and machines so that there is an appreciated difference between what each is expected to achieve. Based on the interactions training can be planned, earlier than is typical, for new job system processes and alternative job roles. Lessons are fed back into both consultants and the business to ensure superior project implementation in the future.

The third theme is Ethics and Legislation. The HR department should create an ethical charter containing the companies' commitments to their workforce and how these match UN sustainability goals. There are 4 appropriate goals which are: Goal No.3 – Good Health and Wellbeing, Goal No.8 – Decent Work and Economic Growth, Goal No.9 – Industry, Innovation & Infrastructure, Goal No.11 – Sustainable Cities and Communities. There is a lack of legislation however the HR department can be advocates of seeking out the industry conversations and preparing the company for changes. All goals should be measured by HR and reported upon transparently. When the workplace is likely to be highly automated and there are only a few humans remaining the HR department can advocate human interaction to increase employee satisfaction and a sense of wellbeing.

HRM FRAMEWORK FOR IMPLEMENTING ADVANCED TECHNOLOGY IN THE WORKPLACE

TRAINING & BUSINESS STRATEGY

1 Train HRM
Select a technology advocate within HR to set-up departmental training.

2 Engage Workforce
Engage workforce in technology advisory sessions. Be prepared for the future.

3 Feedback to Business Strategy
Formulate workforce feedback into strategic company goals. Agree ethical charter with board/stakeholders.

4 Provide Value
Sharing and dissemination of information for companies' yearly report and goals.

DIGITAL PROJECT IMPLEMENTATION

1 Represent Workforce
Attend and stake a claim in digital transformation projects. Represent the workforce views.

2 Advise Algorithm Design
Seek cooperative human-machine job roles. Retain human decision makers. Balance human productivity with automated efficiency. Engage workforce in AI:ML design.

3 Train & Re-Train
Organise training for workforce on new technology. Organise retraining for alternative roles.

4 Feedback Project Lessons
Feedback lessons to business and consultants for future projects.

ETHICS AND LEGISLATION

1 Create Ethical Charter
Create and champion an ethical charter within the business.

2 Engage with Legislation
Review and contribute to legislation. Review and assess other companies approaches to legislation or advisements.

3 Measure & Report
Provide transparent measurement and publish performance.

4 Advocate Humans
Encourage and provide human to human interaction in highly automated workplace.

Figure 9: A Framework for the introduction of advanced technologies into the workplace

8.7 Discussion Summary

The research discussion was based around the 4 themes which emerged from the research results and findings. The important opinions were captured in a graphical framework. The framework has implications for the HRM department as it provides additional tasks to be performed to fulfil their role towards corporate social responsibility.

9. RESEARCH CONCLUSIONS AND RECOMMENDATIONS

The research set out to study if the introduction of advanced technologies could lead to workforce motivational issues, less productivity, and societal issues. The aim was to produce a framework for the HRM department which could be used for upcoming digital transformation projects within highly industrialised environments.

The research data concludes that previously HRM departments have not engaged the workforce to prepare them for job role changes when these types of projects are initiated. The research results demonstrate how technology can be perceived both positively and negatively however it has the potential to greatly lower the workforce quantity, quality of job and cause a lack of worker wellbeing. The research implicitly inferred that the result of less workers in the workforce is potentially a societal breakdown as there are less people paying taxes and in turn less governmental funding for infrastructure and benefits. The result of the research is the HRM framework and a recommendation for governmental legislation to regulate the impact of technology and to ensure ethical approaches within business.

The research was limited in scope considering humans and technology in an industrial setting, mainly aviation. Theoretical development could consider the wider implications for other industry sectors such as healthcare, retail, transport, logistics, law, accounting and even the armed forces where the research data may be evaluated to ascertain if the same findings apply.

The research results in significant implications upon the HRM profession. The developed framework can be incorporated into a company's corporate social responsibility charter to demonstrate their social mission to positively impact society by concerning themselves with the welfare of the workforce. There are implications for the wider social impact. Retaining humans and balancing the productivity with technology will seek to ensure there are future populations which pay governmental taxes, feel valued and have a sense of mental wellbeing, have rights within the workplace to be retained and retrained, and that there is investment in humans and not just technology.

The research method involved interviewing experienced technology professionals who have implemented digital transformations within companies, primarily airports. The semi-structured interviews provided opinions on future of work and experiences of working with HRM departments and workforce end-users. The approach was taken for convenience and was effective to gain insight into the professional experiences however an alternative approach would be to seek a more diverse population for the interview which may consist of members from the HR community, line managers and team leads within industrialised environments and C-level operations managers. The results regarding future technologies,

their workplace impact was expected. Unexpectedly there was a shortage of experience addressing the impacts upon the workforce itself. It was unexpected that the HRM departments had never been involved throughout the interviewees experience across multiple technology projects. It was anticipated that there would have been at least some engagement however this supported the research that the HRM departments need to be greater involved with the workforce they represent.

The interviews produced high-level themes which were sub-divided into topics. The themes were HRM departments, the workforce, future technology, and regulation.

The outcome of the research is a recommended framework, presented in the discussion chapter, which HRM departments can utilise. It has three sections with 4 actions in each section. The framework provides the HRM department with guidance and results in the human workforce having a voice in the formation of requirements for technology projects which may affect their work environment.

There are new questions which arise for the future which this research could not cover due to its limited scope. To successfully implement a new framework, it would be necessary to ask why they have not had engagement in the past and is this intentional. The research is limited by existing methodological literature, to compel business to act ethically future research should ask why there is currently a lack of legislation or guidance and are highly industrialised environments expected to self-regulate. Future research can also ask what the timescales are for advanced technologies and at what time governments need to enact policy changes to prevent societal issues.

The research can help build across other areas such as the software programming of robotics to provide a steer for ethical robot rules. Algorithms should not be biased, and programmers can work with business departments, within regulatory frameworks, to ensure human machine interaction is balanced. This can lead to increased job satisfaction that would otherwise be achieved without interaction between developers and the workforce.

The dominant authors in the technology domain recorded in the literature review included Tegmark, Ford and Pettinger. The research aligned with Tegmark's (2017) view that the whole bottom job pyramid is at risk by automated technology. Tegmark also viewed that the machines do the financial earning and pay back to society. The research determined that society will be deeply affected however future research may investigate how machines and their business owners would be encouraged to provide a portion of profit for societal gain. Pettinger (2019) stated that robots are not consumers and add no financial benefit to society.

The research resulted in a HRM framework which supports the retaining and retraining of the existing workforce so that they feel valued and have meaningful working lives.

The theory of Stein et al (2020) is supported and HRM is ignoring the topic of automation and that of Bondarouk (2005) that all IT implementations are turbulent. The research infers that the involvement of HRM may lead to better outcomes for the workforce and the business. It posits that the benefits seen from ethical compliance can help to meet UN goals and function as an additional marketing topic providing their clients with transparency.

The literature review recognised a gap in the knowledge of how HRM departments interact with digital transformation projects and how they seek to represent their workforce with technology consultants. This research has provided additional information into this domain.

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11.　　APPENDIX A – PARTICIPANT INFORMATION SHEET

Business Students Instrument
(Kevin McLoughlin S19002013)

Research Study Title: Can the introduction of new advanced technologies if unplanned and unmanaged lead to demotivation in the workforce with negative results.
What are the frameworks which HRM departments can implement to maintain reward and motivation?

Date: 20th June 2022

Participant Information Sheet

Introduction
My name is Kevin McLoughlin and this research forms part of my Master's study at Glyndŵr University. You are being invited to take part in this research. Before you agree to do so, it is important that you understand the purpose and nature of the research and what your participation will involve, if you agree. Please read the following information carefully, and please ask if anything is not clear, or if you want more information. Contact details are given at the end of this information sheet.

What is the purpose of the study and how will it be carried out?
The research objectives are:
1   To investigate the historical effects of introducing technology to a workplace in terms of employee motivation and if this was successful or unsuccessful.
2   To understand which technologies may be implemented in the future, especially within an airport environment.
3   To understand HRM strategies towards implementation of technology and keeping the workforce motivated.

The research methodology is (in outline);
1.   Conduct a literature review on previous academic theories and strategies.
2.   Conduct an interview with 7 persons each with a differing viewpoint such as:
    a.   Airport Technologists with an understanding of Industry 4.0
    b.   Airport manager with experience of cargo operations and implementation of technology projects
    c.   HRM manager with experience of implementing technology in industrial environments.
3.   Analysis of the literature, analysis of the interview responses to then form:
    a.   Proposed framework for HRM to manage technology introduction into an airport operational environments.

Why have I been invited to take part?
The aim to recruit participants who are experienced in either technology, airport operations or HRM strategy. You have been identified through our professional relationship as matching one of these experiences.

Do I have to take part?
Participation is entirely voluntary. It is up to you to decide whether or not to take part. If you agree to take part, you will be asked to consent digitally (see bottom of this form). If you agree to take part, you may still withdraw at any time, without giving a reason. If this happens, please note that you will not be

able to withdraw your data after it has been anonymised. Personal data is usually made anonymous quickly after data collection.

What will taking part involve?
Taking part will involve setting aside one hour for an interview conducted remotely. The interview will be recorded using Microsoft Teams so that I may focus on asking and developing the questions. I will transcribe the interview and place this into analysis software called NVivo.

Will my participation be confidential?
All information about you collected during the study will be kept strictly confidential and stored securely in accordance with the Data Protection Act. The only people who will know about you are the researcher and my Principal Supervisor/Project Tutor. All data, whether electronic or paper or in any other form will be destroyed once the Masters is completed (Expected by end of 2022).

What will you do with the results of the research?
Data collected from the structured interviews will be analysed and will be incorporated into a Master's dissertation. No participant will be identifiable in the dissertation. A copy of the research will also be made available to you.

What happens next?
Thank you for reading this information sheet. If you agree to take part, please return the consent form and I will contact you to arrange a suitable date and time for the interview. I will send an invitation through Microsoft Teams. The interview is expected to last approximately one hour.

You can take a copy of this participant information or the consent form to keep by right clicking and selecting print.
If you wish to raise any concerns about any aspect of how you have been approached or treated in respect of this research study, please contact:
Stewart Milne: Head of Research Services (s.milne@glyndwr.ac.uk)

Contact for further information
If anything is not clear, or if you want more information, please contact me directly: emails:
S19002013@mail.glyndwr.ac.uk or kevin@originprojectsgroup.com

Telephone: +(44) 7795 011504

Participant consent

Research Study Title: Can the introduction of new advanced technologies if unplanned and unmanaged lead to demotivation in the workforce with negative results.
What are the frameworks which HRM departments can implement to maintain reward and motivation?

Name of Researcher: Kevin McLoughlin

Please carefully read each statement:

I confirm that I have read the WGU Research Participant Privacy Notice:
 https://www.glyndwr.ac.uk/en/InformationGovernance/PrivacyStatements/
 .

(https://www.glyndwr.ac.uk/en/InformationGovernance/PrivacyStatements/)

I confirm that I have read and understood the Participant Information Sheet dated [insert date - month year format] for the study. If I have asked for clarification or for more information, I have received satisfactory responses.

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason. I understand that any data I have contributed cannot be withdrawn after it has been anonymised.

I understand that relevant sections of the anonymised data collected from me during the study may be looked at by the researcher and students for a period of 3 years before destruction.

I agree to take part in the study.

1. Consent: *

   ◯ I agree to the above statements and confirm that I wish to participate

   ◯ I do not agree to participate

12. APPENDIX B – SEMI-STRUCTURED QUESTIONNAIRE

The questions have not been ordered and the researcher may choose from the most appropriate question according to the interviewee background. Some questions have been marked as 'specific HRM (SH)' as they are most appropriate for the HRM interviewee.

1. What are the main airport projects you have been involved with that saw the introduction of advanced technologies?
2. Focussing on one project can you elaborate on the types of technologies involved?
3. At the time which, if any, of these technologies did you consider to be advanced?
4. Which operational departments were involved in the discussion regarding the technologies?
5. In your experience is it normal for the HRM department to be consulted?
6. In the next 10 years do you think there will be a reduction in the overall workforce size at an airport (Assume the airport throughput of passengers, flights and cargo remain constant).
7. In the next 20 years do you think there will be jobs which may not exist altogether?
8. Do you think new jobs may be created through advancements in technology such as maintenance of robotics? Would these be to the same quantity as the jobs which may be lost?
9. If the workforce is retrained so you think these jobs would be of equal value to the previous jobs?
10. SH - When forming the HRM approach to resourcing for airport operational departments do you consider any of the traditional reward models such as Maslow or contemporary frameworks such as goal setting or expectancy theory. Is there a dominant model?
11. SH – How does HRM measure the effectiveness of a technology change project?
12. SH – What involvement does the HRM department have in technology change projects, this includes major airport projects such as new airports, significant increases in capacity or function?
13. SH – What do you think about reward for employees if their job function becomes less in demand and there are many resources to choose from? Do you think they should be paid less?
14. SH – Were robotics may replace human workforce (Examples, Cargo Make & Break, General Cleaning, Baggage movement, Stand management) and the skill set of the workforce is diluted do you think the workforce should get the same level of reward?

15. Let us, for context, consider the following advanced technologies which may be a motivational or demotivational category to the airport workforce, can we quickly check which ones belong in either category:
    a. Digital Twin
    b. Autonomous Electric Vertical Take Off and Landing
    c. Automatic Passenger Boarding Bridges
    d. Baggage robotics (tray and lifting/ULD loading)
    e. Material handling (cargo) robotics
    f. Machine vision
    g. Cleaning robotics
    h. 5th Generation Mobile
    i. LIDAR – Light detection and ranging
    j. Virtual reality (i.e., customer service agents)
    k. Radio Frequency Identification messaging
    l. Airport passenger or operational mobile applications
    m. Biometrics and seamless travel
    n. Autonomous Drone logistics – last mile deliveries
    o. Internet Of Things
    p. CCTV Analytics
    q. Machine learning (i.e., for aircraft maintenance resource management, identification of delayed flights, chatbots, boarding congestion avoidance)
    r. Artificial Intelligence (I.e., Security search areas remote screening/cyber security, crowd control)
    s. Remote Digital Air Traffic Control Towers
    t. Air Traffic Control Artificial Intelligence (radar simulations, airspace efficiency)
    u. Self-Driving Vehicles (Perimeter security, automated people movers or parking robots, autonomous battery powered robot aircraft tows)
    v. Self-Bag Drop (off-site)
    w. Common Use Self Service
    x. Augmented Reality (I.e., airport guidance, aircraft maintenance)
    y. Humanoid robots (i.e., customer service agents)
    z. Bid Data (I.e., Centralised Terminal Management)
16. How do you think project technology designers or operations departments considering implementing new or advanced technologies work with the HRM department to prepare the workforce?

17. What are the moments of interaction between HRM department and the operations and capital projects departments during technology identification and implementation?

18. When the airport industry discuss SMART, Digital Transformation or Industry 4.0 do you see any difference between these terms?

19. What are the primary purposes of the implementing technological change?

20. Do you believe HRM should have a role in implementing technology change or is it primarily the responsibility of the operational department or capital project?

21. Which advanced technologies do you believe will have the greatest impact on the workforce in years to come?

22. Considering the project feasibility stage, in your previous experience, have you coordinated with the HRM department/operational department to discuss the impacts technology will have on the workforce?

23. Concerning the operational readiness phase of a technology project what role has the HRM played in past projects?

24. In the case of robotic implementation specifically should the workforce be compensated for responsibility loss?

25. In your experience have there been opportunities for the workforce to have their say on the implementation of advanced technologies (this excludes the managerial levels)?

13.   APPENDIX C - REFERENCE LIST OF ADVANCED TECHNOLOGIES

a. Digital Twin

b. Autonomous Electric Vertical Take Off and Landing

c. Automatic Passenger Boarding Bridges

d. Baggage robotics (tray and lifting/ULD loading)

e. Material handling (cargo) robotics

f. Machine vision

g. Cleaning robotics

h. 5th Generation Mobile

i. LIDAR – Light detection and ranging

j. Virtual reality (i.e., customer service agents)

k. Radio Frequency Identification messaging

l. Airport passenger or operational mobile applications

m. Biometrics and seamless travel

n. Autonomous Drone logistics – last mile deliveries

o. Internet Of Things

p. CCTV Analytics

q. Machine learning (i.e., for aircraft maintenance resource management, identification of delayed flights, chatbots, boarding congestion avoidance)

r. Artificial Intelligence (I.e., Security search areas remote screening/cyber security, crowd control)

s. Remote Digital Air Traffic Control Towers

t. Air Traffic Control Artificial Intelligence (radar simulations, airspace efficiency)

u. Self-Driving Vehicles (Perimeter security, automated people movers or parking robots, autonomous battery powered robot aircraft tows)

v. Self-Bag Drop (off-site)

w. Common Use Self Service

x. Augmented Reality (I.e., airport guidance, aircraft maintenance)

y. Humanoid robots (i.e., customer service agents)

z. Bid Data (I.e., Centralised Terminal Management)