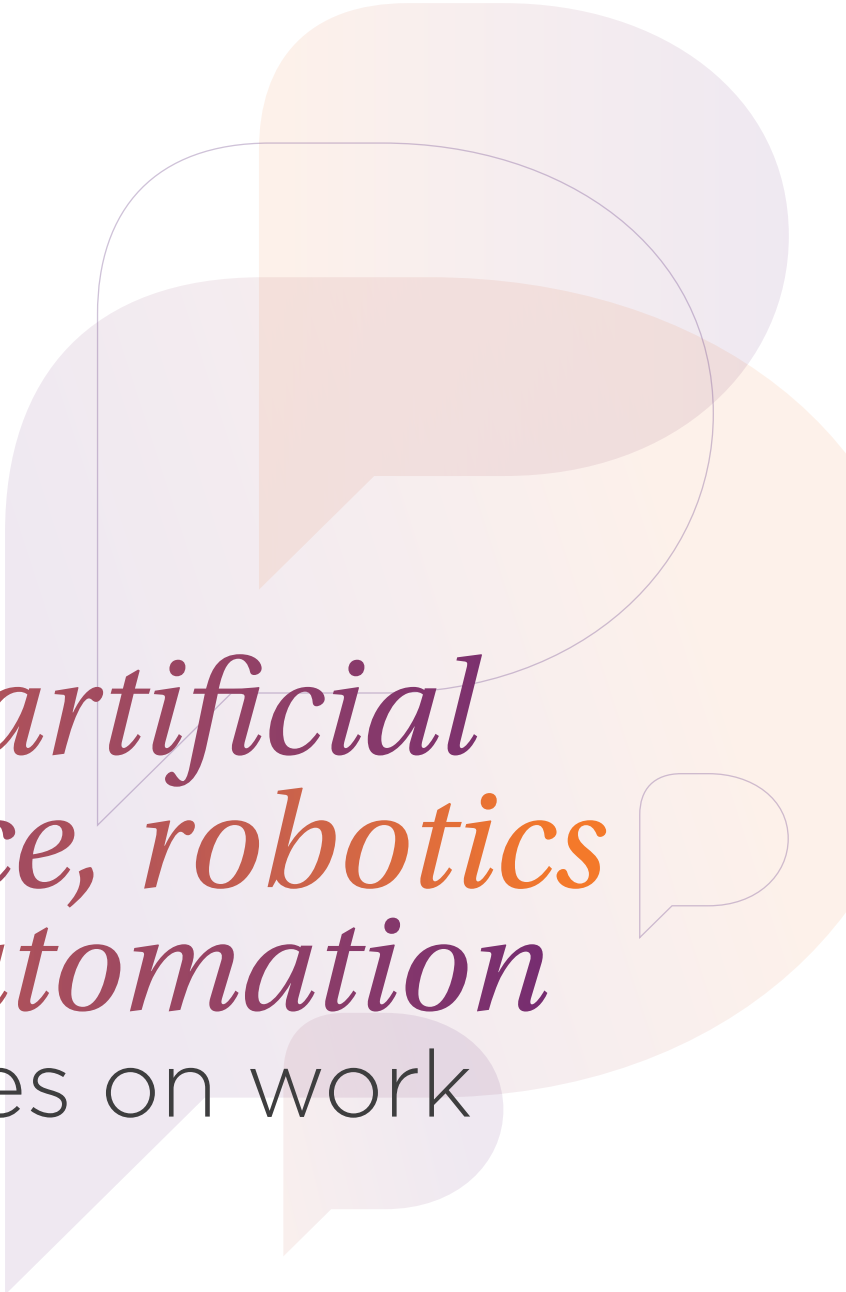


# CIPD

Championing better  
work and working lives

## Appendices

December 2017



Impact of *artificial  
intelligence, robotics*  
and *automation*  
technologies on work

The CIPD is the professional body for HR and people development. The not-for-profit organisation champions better work and working lives and has been setting the benchmark for excellence in people and organisation development for more than 100 years. It has more than 145,000 members across the world, provides thought leadership through independent research on the world of work, and offers professional training and accreditation for those working in HR and learning and development.

## Appendix A: Search results

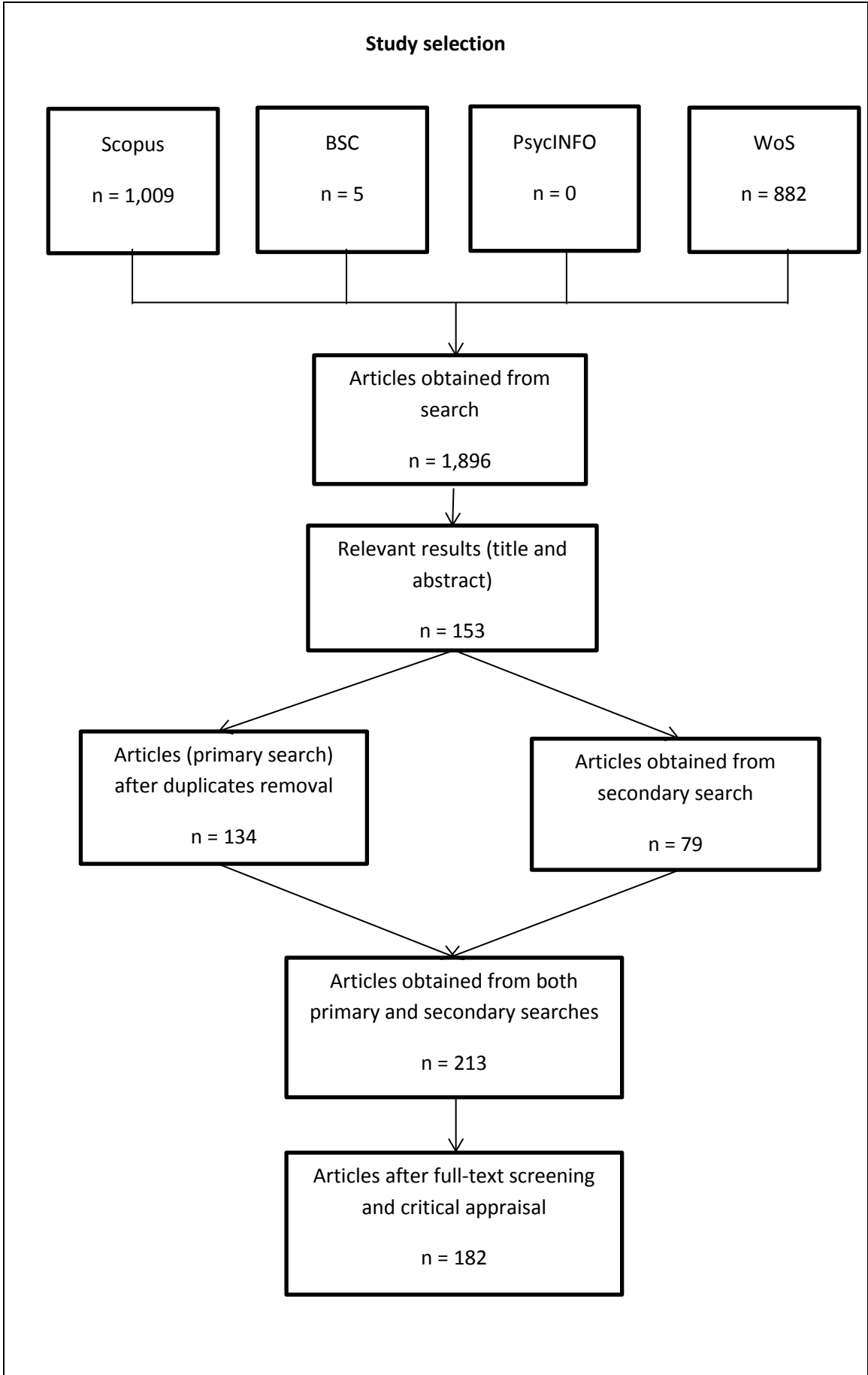
Search words	Databases									
	Scopus		EBSCO: Business source complete		EBSCO: PsycINFO		Web of Science		All	
	All	R <sup>1</sup>	All	R	All	R	All	R	All	R
Artificial intelligence/ innovation	24	15	0	0	0	0	20	4	44	19
Artificial intelligence/ productivity	16	11	1	1	0	0	6	2	23	14
Artificial intelligence/quality of working life	0	0	0	0	0	0	2	0	2	0
Artificial intelligence/ employment	3	0	0	0	0	0	3	0	6	0
Artificial intelligence/business value	18	6	0	0	0	0	2	0	20	6
Artificial intelligence/social impact	13	7	0	0	0	0	4	1	17	8
Artificial intelligence/autonomy	18	6	0	0	0	0	6	0	24	6
Artificial intelligence/collaboration	15	4	0	0	0	0	8	1	23	5
Artificial intelligence/human computer* interaction	13	7	0	0	0	0	8	1	21	8
Artificial intelligence/ethics	10	9	1	1	0	0	8	0	19	10
Artificial intelligence/service work	16	5	0	0	0	0	12	3	28	8
Artificial intelligence/knowledge work	35	3	0	0	0	0	22	2	57	5
Artificial intelligence/ adoption	9	0	0	0	0	0	4	2	13	2
Artificial intelligence/ implementation	90	6	0	0	0	0	52	4	142	10
Smart machine*/innovation	2	0	0	0	0	0	2	0	4	0
Smart machine*/productivity	3	0	0	0	0	0	2	0	5	0
Smart machine*/quality of working life	0	0	0	0	0	0	1	0	1	0
Smart machine*/employment	0	0	0	0	0	0	0	0	0	0
Smart machine*/business value	1	1	0	0	0	0	1	0	2	1
Smart machine*/social impact	0	0	0	0	0	0	0	0	0	0
Smart machine*/autonomy	0	0	0	0	0	0	1	0	1	0
Smart machine*/collaboration	1	0	0	0	0	0	2	0	3	0
Smart machine*/human computer* interaction	1	1	0	0	0	0	0	0	1	1
Smart machine*/ethics	1	1	0	0	0	0	0	0	1	1

<sup>1</sup> Relevant papers

Search words	Databases									
	Scopus		EBSCO: Business source complete		EBSCO: PsycINFO		Web of Science		All	
	All	R <sup>1</sup>	All	R	All	R	All	R	All	R
Smart machine*/adoption	1	1	0	0	0	0	1	0	2	1
Smart machine*/service work	1	1	0	0	0	0	3	1	4	2
Smart machine*/knowledge work	0	0	0	0	0	0	0	0	0	0
Cognitive computing/innovation	6	1	0	0	0	0	4	0	10	1
Cognitive computing/productivity	2	0	0	0	0	0	2	0	4	0
Cognitive computing/quality of working life	0	0	0	0	0	0	0	0	0	0
Cognitive computing/employment	0	0	0	0	0	0	0	0	0	0
Cognitive computing/business value	1	0	0	0	0	0	0	0	1	0
Cognitive computing/social impact	0	0	0	0	0	0	0	0	0	0
Cognitive computing/autonomy	0	0	0	0	0	0	0	0	0	0
Cognitive computing/collaboration	0	0	0	0	0	0	0	0	0	0
Cognitive computing/human computer* interaction	4	1	0	0	0	0	2	1	6	2
Cognitive computing/ethics	0	0	0	0	0	0	0	0	0	0
Cognitive computing/adoption	2	1	1	1	0	0	1	0	4	2
Cognitive computing/implementation	12	0	0	0	0	0	8	0	20	0
Cognitive computing/service work	0	0	0	0	0	0	1	0	1	0
Cognitive computing/knowledge work	5	0	0	0	0	0	1	0	6	0
Automation of knowledge work	1	1	0	0	0	0	0	0	1	1
Automation of knowledge work/innovation	0	0	0	0	0	0	0	0	0	0
Automation of knowledge work/productivity	0	0	0	0	0	0	0	0	0	0
Automation of knowledge work/quality of working life	0	0	0	0	0	0	0	0	0	0
Automation of knowledge work/employment	0	0	0	0	0	0	0	0	0	0
Automation of knowledge work/business value	0	0	0	0	0	0	0	0	0	0
Automation of knowledge work/social impact	0	0	0	0	0	0	0	0	0	0
Automation of knowledge work/autonomy	0	0	0	0	0	0	0	0	0	0

Search words	Databases									
	Scopus		EBSCO: Business source complete		EBSCO: PsycINFO		Web of Science		All	
	All	R <sup>1</sup>	All	R	All	R	All	R	All	R
Automation of knowledge work/collaboration	0	0	0	0	0	0	0	0	0	0
Automation of knowledge work/human computer interaction	0	0	0	0	0	0	0	0	0	0
Automation of knowledge work/ethics	0	0	0	0	0	0	0	0	0	0
Automation of knowledge work/applications	0	0	0	0	0	0	0	0	0	0
Automation of service work	0	0	0	0	0	0	0	0	0	0
Robot*/knowledge work	369	12	1	1	0	0	373	5	742	18
Robot*/service work	311	10	0	0	0	0	315	10	626	20
Robotic process automation	6	1	1	1	0	0	5	0	12	2
Totals									1,896	153

Appendix B: Review population sampling summary



## Appendix C: Summary notes on 182 sources included in final sample

\***Source type** (for example peer-reviewed article, book, report)

\*\***Extent of utilising empirical evidence** (1. rigorous/detailed empirical evidence, 2. second-hand evidence, 3. detailed anecdotal examples, 4. brief anecdotal examples, 5. Viewpoint only)

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
1	Ackerman & Guizo 2011	Professional association magazine	Advances in web technology	Comment piece	Highlights five technologies likely to change the web, including smartphones, video, IoT, big data and voice recognition. Predictions actually quite accurate!	Not primarily focused on work context, just considering technology change in general.	5
2	Adelson 2011	Peer-reviewed journal	Cognitive computing and human-computer interaction	Historical account of Stuart Card's contribution to the cognitive computing field	Historical account of theories for human-computer interaction.	Historical account – no additional method provided.	2
3	Albu & Stanciu 2015	Conference proceedings	AI in medical predictions	Comment piece	Argues that AI technology can facilitate decision-making and predictions in medicine.		5
4	Alizadehsani et al 2016	Peer-reviewed journal	Detection of coronary heart disease via computer data analysis	Analysis of existing medical database using new analytical technique	Tested new data mining technique to improve diagnosis of CAD (coronary artery disease), which proved to increase accuracy of diagnosis over existing methods.	Experimental text of new method rather than application of technique to new patients.	1
5	Ambrose 2014	Conference paper	Automation	Comment piece	Examines the challenges of developing laws to deal with ethical issues related to increased use of automation at work.	–	2



No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
6	Amershi et al 2011	Conference paper	AI; interactive machine learning	Secondary literature review; prototype description	Description of three cases of design of effective end-user interaction with machine learning in a system developed to support web image search. Discussion on the optimum balance between the needs of end-users and machine learning algorithms.	Limited relevance to our focus – the focus is mostly upon the engineering design of effective interactive learning machines and thus the impacts of AI technology on individuals'/organisational learning are suggested indirectly.	2
7	Ardiansyah 2016	Conference paper	Electronic software narrator for assistant robot for blind people	Proof of concept, experiment	Tests influence of lighting conditions on optical recognition process.	Proof of concept; Prototype design not implemented. No empirical testing.	1
8	Arntz et al 2016	OECD working paper	Evaluates jobs in relation to risk of automation	Original task-based analysis of jobs in OECD countries	Use a task-based analysis to estimate extent to which jobs, or parts of jobs, can be automated in OECD countries. 9% of jobs identified as at risk of automation, significantly lower than occupation-based analyses. This risk varies significantly between countries. Impact of technology adoption on employment affected by multiple factors. Conclude by arguing risk of large-scale unemployment limited.	–	1
9	Aron et al 2011	Peer-reviewed journal	Automation of error prevention in medical contexts	Analysis of archival data on medical errors from 2 hospitals	Training in automation of error prevention helps reduce interpretative medical errors.	–	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
10	Ashrafian 2014	Peer-reviewed journal	AI; robotics; ethics	Secondary literature review; conceptual paper	Suggestions regarding future developments in respect of machine ethics and rights, as well as potential societal impacts (for example support of human political rights, human freedom of expression and human culture). Arguments around the need of determination of socio-political controls for robots and artificial intelligence agents and the need of a robust legal platform.	Comes from a broad philosophical perspective; raises ethical questions that need answering in the future.	2
11	Ashrafian 2015	Peer-reviewed journal	AI	Comment piece	Considers neglected need in near future for law covering computer-computer interaction. Existing work has focused primarily on human-computer interaction only.	–	5

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
12	Autor 2015	Peer-reviewed journal	Automation	Detailed analysis of a wide range of historical evidence on link between employment and automation in USA	Article about impact of automation on employment levels – workers and society-level impact. Historical evidence suggests that media and academic concerns about large-scale unemployment due to automation has been exaggerated, and while automation reduces need for people to do some tasks, it also has other benefits to employment – not on substituted labour, but also complements and augments, creating increased demand for labour in new ways. Concludes by suggesting this likely to continue with new robotic technology and AI, where scope for full labour substitution faces significant challenges.	–	1
13	Badke 2015	Magazine article	AI	Comment piece	Examination of whether AI will eliminate need for information/library professionals. Links to Ford’s pessimistic view of mass joblessness. Argues that there will still be a need for information professionals.	Brief comment piece	4

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
14	Baggili & Breitinger 2015	Conference paper	AI; big data	Secondary literature review; conceptual paper	Description of how cyber forensic works using social media as a data source and its importance for cyber security. Emphasis on challenges and opportunities.	Narrow focus on the specifics of cyber forensics and some of its sources. No empirical data/testing of applications. Does not demonstrate directly impacts on workers, organisations, and so on.	2
15	Balfe et al 2015	Peer-reviewed journal	Automation of rail signalling	Field experiment (in real signal box) using realistic automation model and genuine, experienced signallers	Impact of level of automation on (perceived) workload and performance, examining 3 levels of automation. Identified positives of automation – as automation levels increased, perceived workload (physical and mental) decreased, and consistency of performance increased.	Experimental study, not data from real-life situation.	1
16	Balkin et al 2011	Peer-reviewed journal	Monitor for human fatigue levels in transportation workers	Secondary literature review	Review of positives and negatives of various technologies (wrist mounted, ocular, EEG) and regulation for monitoring transportation workers' fatigue levels. Speculates on role of technology for automated, real-time evaluation of driver fatigue. One issue is human–technology dynamic and importance of human trust in technology.	Review of current issues and speculation on future technology rather than evaluation of impact of new technology.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
17	Balram et al 2016	Open access journal	Diverse smart and digital health technologies	Extended comment piece extrapolating from existing technology imagining near-future scenarios	Outlines a vision of the near future where healthcare provision and consumption is transformed, at both micro and macro level, by new digital and smart technology. At micro level use of smart technology and wearables allows for constant real-time monitoring of health. At macro level such data is managed via dispersed digital tele-health networks of providers.	–	4
18	Baril et al 2014	Peer-reviewed journal	Medication distribution technology	Evaluation of operation improvements resulting from implementation of technology in pharmacy and care home	Presents evidence that use of automated distribution technology had operational benefits for pharmacy and care home.	–	1
19	Barua & Barua 2012	Peer-reviewed journal	ICT	Critical literature review	Discussion on the gendered impacts of ICT on people, organisations, and society (for example strengthening the existing gender stereotypes, changing identities, 'cyber feminism', re-definitions of men-machine interaction).	Although thought provoking, does not specify knowledge gaps and directions for future research.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
20	Bekele et al 2013	Peer-reviewed journal	Humanoid robot for therapy interventions with children with autism spectrum disorders (ASD)	Proof of concept experiment; pilot usability experiment with 6 children with ASD and 6 typically developing children.	Children with ASD spent more time looking at humanoid robot compared with TD children – suggests that humanoid interventions may be more effective than human-administered therapies.	Small sample size over short timeframe. Not clear whether greater attention was due to novelty of presence of robot.	1
21	Bekier et al 2011	Peer-reviewed journal	Automation of air traffic management decision-making	Analysis of survey with ATCs on two hypothetical automation scenarios	Examination of factors affecting ATCs' willingness to accept increased level of automation in two scenarios. Job satisfaction only consistent predictor, but trust in system, and age also had impact.	–	1
22	Rever et al 2015	Conference paper	Computer systems		Ethical issues related to conflict between people and computer systems.	–	5

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
23	Bennett & Hauser 2013	Peer-reviewed journal	AI (non-disease-specific computational/artificial intelligence system)	Empirical article with clinical data from the electronic health record for over 6,000 patients from a US hospital; data for 500 randomly selected patients were used in simulations.	Proposed framework that incorporates modern computational approaches, which use clinical data and enable the development of complex plans via simulation of numerous, alternative sequential decision paths. Demonstration of the feasibility of this approach relative to human decision-making performance (for example higher outcomes or lower costs). A list of recommendations for future research/optimisation regarding extending the proposed framework as a technical infrastructure for delivering personalised medicine.	Useful information about potential applications of AI in healthcare.	1
24	Bibel 2014	Peer-reviewed journal	AI	Historical analysis of AI in Europe (up to 1985), followed by brief speculation	Suggests AI may have the possibility to enrich society through the intelligence it can provide to societal decision-making, but acknowledges there is likely to be significant human resistance to this.	Limited relevance. Largely historical, with brief speculation on future of AI and its impact for society.	5
25	Bilal et al 2012	Conference workshop	Smart parking system	Experiment; conceptual model tested in simulation environment.	Prototype for intelligent parking system to allow drivers to find parking spaces easily.	Proof of concept; prototype design not implemented. No empirical testing.	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
26	Bocci et al 2013	Peer-reviewed journal	Robotic surgery (performed by surgeons)	Experiment; 16 right-handed (6 female, 10 male) surgeons; ECG taken of brain activity when performing keyhole surgery compared with robotic surgery to complete same task.	Quantitative evidence from experiments to indicate that different parts of the brain used depending on whether using robotic surgery or not. Suggests that robotic surgery may be easier to learn for a surgeon without needing long cognitive training.	No empirical testing. May be other factors influencing differences in ECG activity recorded.	1
27	Bogue 2012	Peer-reviewed journal	Robots in scientific laboratories	Secondary review	Review of diverse use of robots in laboratories – argues to have economic and operational benefits for laboratories – including reduced manpower. AI developments argued to have potential to significantly change their role.	–	2
28	Boman & Gillblad 2015	Conference paper	AI analysis of big data (syndromic surveillance); computational epidemiology; learning machines	Secondary literature review organised in three cases	Focus on the need of improving and the ways to improve digital services to monitor, model, and mitigate the effects of epidemiological disease using AI. Two cases specifying the state-of-the-art and one about the applications of learning machines in near future. Brief outline of potential impacts on organisational decision-making and the social value of improved disease prevention/monitoring.	Method is not clearly specified. Potential impacts on organisational decision-making and effectiveness, society are suggested indirectly.	2



No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
29	Bostrom & Yudkowsky 2011	Handbook chapter	AI; machine and human ethics	Secondary review and comment on machine (AI) ethics and ethical use of machines	Overview with comment on the challenges and complexity of machine ethics, the differences between human and machine intelligence and ethics/morality. Suggestions about future advances of AI machines in terms of machine ethics.	Although focused upon AI ethics, has limited relevance to our focus – does not specifically look at the work-related ethical aspects of AI technology.	3
30	Broussard 2015	Peer-reviewed journal	Intelligence-based software system for data sorting and identification of investigative storytelling opportunities	Experiment with education data/pilot project, US	Description and demonstration (through an experiment with a prototype) of the way in which artificial intelligence-based software system supports public affairs reporters in sorting through data and identifying investigative storytelling opportunities. Comment on the potential benefits of such approach.	Example of how AI can support effectively work tasks and workers.	2
31	Bryson 2016	Conference paper	AI/robot ethics	Secondary literature review; position paper	Overview of several broad perspectives including social behaviour, freedom and morality, principles of robotics, and so on. Introduction/discussion of the principles of defining AI/robot ethics/morality and building moral robots.	Position paper that does not explore empirically the antecedents and consequences of machine ethics.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
32	Burkhard 2013	Conference (invited) paper	Intelligent systems (machines); AI; robots; development of the field	Secondary literature review	Overview of recent development of AI and robotics, opportunities and challenges (problems). Functions and use of AI machines especially in the context of machine-informed decisions.	Useful definition and explanation of AI (intelligent machines) in comparison with human intelligence. Mostly about the design of intelligent machines with no direct references to the impact of AI on work and workers.	2
33	Byun & Byun 2013	Peer-reviewed journal	Biometric identification technologies	Survey of customers of an American bank which uses biometric technology for ATMs	Found that users of ATM found that enjoyment was main benefit from technology use. Security, time-saving and cognitive effort saving also benefits but less significant.	–	1
34	Calo et al 2011	Workshop technical report	Pet behaviour mimicking robot (Paro) for improving the lives of elderly dementia patients	Critical literature and documents review	Review and analysis of the use of Paro robots in health care (particularly with elderly dementia patients). Major focus on benefits and ethical considerations, impacts of robots (Paro) on people.	Focus on the patient–robot interaction, not directly on the impact of robots on work. Interesting discussion on the ethical aspects and human–machine interaction.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
35	Cavalacante et al 2016	Peer-reviewed journal	Computers/software for analysing big data and supporting decision-making in financial markets	Literature review of studies between 2009 and 2015	While main aim of all studies/applications was to improve prediction of future market trends, there is limited success. Virtually all methods proposed haven't been tested in real-world situations.	Secondary review of existing studies. Existing studies propose models, but they aren't tested and evaluated for effectiveness.	2
36	Chang 2012	Peer-reviewed journal	AI/big data; machine learning; neural networking for preventative screening of young athletes	Critical literature and documents review; conceptual paper	Overview and detailed analysis (status, pros and cons) of current screening electrocardiogram approaches for detecting risk of cardiac death in young athletes. Justified suggestions of future applications of AI (machine learning and neural networking) to cardiology practice.	Good quality paper demonstrating important work applications of AI. While pointing out the importance of AI for clinical practice, it does not discuss technology impacts on workers, organisations, and so on, directly.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
37	Charalambous et al 2015	Peer-reviewed journal	Robots in manufacturing environment – human–robot collaboration	Qualitative case study; single exploratory case study – UK aerospace manufacturing company. 12 interviews with shop floor operators, engineers, system designers, management and union personnel	Enablers for human–robot collaboration: operator participation in the implementation, communication of the change to the workforce, visible senior management commitment and support to the project, provision of training to the workforce, empowerment of the workforce and existence of a process champion during the implementation. Barriers: lack of union involvement, lack of awareness of the manual process complexity by the system integrator, capturing the variability of the manual process prior to introducing the automated system and allocation of resources for the development of the automated system.	Single case study, small number of interviews.	1
38	Charchat-Fichman et al 2014	Peer-reviewed journal	New technology with a variety of examples (for example voice responding systems, interactive computer cognition tests, simulations, and so on)	Historical and narrative review/literature review	Overview of how technological innovations have been applied to clinical neuropsychology historically. Discussion of advantages and disadvantages of some technologies, but mostly generic technology for neuropsychological assessment and rehabilitation (for example computer tests).	Some generic suggestions of moderators and mediators regarding technology impact on individuals.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
39	Chaudhuri & De 2011	Peer-reviewed journal	AI/big data; machine learning; new soft computing tool viz.(fuzzy support vector machine – statistical classification system) to solve bankruptcy prediction problem	Empirical study testing the prediction power of a FSVM using data from 50 largest bankrupt organisations with capitalisation of no less than \$1 billion in the US	Description and testing of a novel soft computing tool. Demonstration of the advantages of the tool in capturing information from corporate data to other (not tech advanced) approaches.	Does not demonstrate specifically the impacts of new technology on work.	1
40	Chen 2013	Conference paper	Robots capable of assistance in scrubbing, cleaning, sorting, packaging instruments and sending them for sterilisation in dental clinic.	Proof of concept, experiment; robot picking up object and placing in a relevant bag	Robot achieves desired activity in prototype.	Partial proof of concept; prototype design not implemented. No empirical testing.	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
41	Chibani et al 2013	Peer-reviewed journal	Ubiquitous robots (ubi-robots)	Draws on literature in the robotics field to present latest trends but no method or literature review process mentioned; conceptual essay	Suggests a range of possible trends for ubi-robots based on selective literature – difficult to gauge validity.	–	2
42	Chui et al 2016	Status of contribution unclear	Automation robots	Brief comment piece about a McKinsey report – half a page of text and 1 diagram	Considers the question of whether robots can do the work of marketers. Discussion of Chui McKinsey report, which looks at automation potential of tasks, not jobs, and estimates percentage of tasks in a job that could be automated. For core marketing roles, 5–20% of tasks could be automated.	–	4
43	Coenen 2011	Peer-reviewed journal	AI; data mining	Secondary literature review	Chronological overview of data mining including its mechanism and techniques, and applications. Some insights into future directions.	Considers the nature and broad applications of data mining, not work-related implications/impacts.	2
44	Colligan et al 2015	Peer-reviewed journal	Electronic patient records in hospital	Longitudinal study of paediatric nurse cognitive workload before and at different stages after implementation	Cognitive workload increased in immediate post-implementation phase. Cognitive workload was also variable between people and was related to people's attitudes to computers.	–	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
45	Collins et al 2016	Peer-reviewed journal	Robot-assisted surgery	Literature review and Delphi study with panel of 23 experts using online survey	Due to robot-assisted surgery being less invasive, radical cystectomy recovery times appear to be shorter. May see more centralised oncologic surgery services for robot-assisted surgery. Provides guidance on standardised perioperative care for patients undergoing RARC robot-assisted radical cystectomy (RARC).	Useful example of reporting Delphi study.	1
46	Conrad & Zeleznikow 2015	Peer-reviewed journal	AI	Systematic literature review; meta-analysis	Overview of the most significant publications in <i>Artificial Intelligence and Law Journal</i> between 2005 and 2014 (as well as conference proceedings in the field) in the context of the presence and form of evaluation (for example efficiency and effectiveness) in published articles.	Insights from the perspective of a 'new' discipline – AI and law. Some information about the proportion of theoretical vs empirical publications on the topic.	2
47	Dang & Tapus 2015	Peer-reviewed journal	Robot	Laboratory experiment with 17 young people testing how people's attitudes and performance are affected by robot assistance (verbal).	Focus on human–robot interaction, and individual impacts of how robot behaviour affects performance and stress levels of people. While people preferred doing experiment with robotic support, having robotic support wasn't directly linked to performance. Also, when robot support was sensitive to user personality, this didn't improve performance either.	Experiment, not real-life situation.	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
46	Davenport et al 2012	Peer-reviewed journal paper	Smart technology/IoT – technologies which can sense environment and adapt independently	Qualitative ethnographic study	Study into attitudes of elderly with mobility needs towards smart technology use which highlights facilitators and barriers.	Implications for smart technology designers.	1
49	Dehais et al 2012	Peer-reviewed journal	Robots (human interaction with). Computer lab simulation	Analysis of human reaction in experiment; military pilots	Conflict in human–computer interaction. Considers effect on human performance of conflict experienced by humans due to use of robots. Experienced conflict resulted in degradation of performance, due to perseverance with task where conflict experienced, even though conflict meant original goal not relevant anymore.	Experimental data, from small study, not data from real-life situation.	1
50	De la Paz-Marín et al 2012	Peer-reviewed journal	Machine learning and neural network classifiers	AI assisted classification, mapping and clustering of R&D from 25 EU member states	Demonstration of the use of advanced technology in predicting the R&D classification in 25 EU countries.	Demonstrates the use of AI as a tool/method in research analysis/academic research professions.	1
51	DeCanio 2016	Peer-reviewed journal	AI; robots	Empirical study using big data sets from the US Bureau of Labor Statistics survey	Explains the possible negative impacts of AI/robots on workers' wages from a socio-economical perspective.	Useful information about potential impacts on AI/new technology on human labour, wages, employment and productivity.	1



No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
52	Del Pino et al 2012	Peer-reviewed journal	IoT; AI; computers; virtual assistants	Narrative scenario	Discussion of the role of virtual assistant/'imaginary friend' in terms of its feasibility and acceptability; potential deep economic and social transformations/impacts.	Thought-provoking with some relevance to potential impacts of technology on individuals and society.	3
53	Dewi et al 2014	Peer-reviewed journal	Swarm service robot	Experiment, proof of concept, simulations	Develops sensor-based approach to allow swarm service robots to avoid collision in dynamic environment of moving obstacles.	Proof of concept; prototype design not implemented. No empirical testing.	1
54	Dilsizian & Siegel 2014	Peer-reviewed journal	IT; AI; big data; machine learning	Literature review; conceptual paper	Overview of the current applications of IT and AI in medicine/healthcare, the definitions of 'artificial intelligence', future applications of AI specifically to cardiac imaging, the barriers to widespread use of AI in the near future. List of 'challenges and opportunities' for using AI.	Discusses applications of technology, but not specifically impacts on work.	2
55	Dirican 2015	Conference paper	Robots, mechatronics, AI	Speculative	Takes a very broad overview and suggests very deep and extensive change for business and employment as a consequence of work-related impact of adoption of AI, and contemporary robots.	–	5
56	Dodig-Crnkovic & Çürüklü 2012	Peer-reviewed journal paper	Robots; artificial morality	Literature review; conceptual paper	Critical overview and discussion of artificial moral/ethics from a mostly design perspective/engineering ethics, common principles and safety regulation issues, definitions of 'artificial intelligence' and 'artificial morality'.	Major focus on the design of moral robots/AI.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
57	Dogan et al 2016	Conference paper	Automated vehicles; ethics	Secondary literature review in the context of a pilot project on testing AV ethics through simulation	Discussion of 'artificial ethics' in general, how it can be applied to AV, suggesting a framework for AV ethics policy in order to regulate interactions with other road users.	Example of AV ethics principles with possible policy applications.	2
58	Doryab et al 2014	Conference paper	Smartphone system/data collection application for monitoring social and sleeping behaviours of patients with depression	Empirical longitudinal study over 4 months with 26 patients in the US	Testing the effectiveness of a smartphone application in capturing patient data and registering behavioural change. Thus, technology helps improve clinical monitoring and decision-making.	–	1
59	Drigas & Ioannidou 2012	Peer-reviewed journal	Role of AI in diagnosis and intervention of special education needs (SEN) within children	Review of existing studies	Review of existing studies into use of AI for diagnosis and intervention of children with special educational needs. Benefits of AI are cost/time saving, improving effectiveness of early diagnosis and intervention.	AI in education context, but has implications for SEN teachers.	2
60	Du et al 2013	Peer-reviewed journal	Smart home technology	Experiment; Chinese study; software prototype design for testing HCI;	Prototype for smart home human interaction focusing on emotions as expressed in words. Experimental design.	Proof of concept; prototype design not implemented. No empirical testing.	1
61	Durairaj & Ranjani 2013	Peer-reviewed journal	Data mining application to healthcare systems	Secondary literature and data review	Overview and comparison of data mining applications in healthcare.	Some information regarding different applications of data mining in healthcare.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
62	Edwards & Ramirez 2016	Peer-reviewed journal	IoT/smart technology/industrie 4.0	Discussion of secondary evidence – academic and grey	Central focus is broad topic of how workers respond to and are affected by implementation of new technology at work. Conceptual paper, which considers 3 illustrative examples, one of which is relevant. Acknowledged that full implementation and use at work is embryonic and may be hype. Main focus on how workers affected, with bias/concern that impacts on workers may be primarily negative. Suggests_German government and hi-tech industry are drivers of this.	–	4
63	Enache et al 2015	Conference paper	Artificial immune systems and swarm intelligence for cybersecurity	Experiment/testing of a new model/prototype	Proposition of an innovative model/prototype (anomaly intrusion detection systems model with active response) to gather suspicious data from the local collector and carry out a second analysis to detect intrusions. Prototype testing. Encouraging results (achieved 61.02% blocking rate for the host).	No empirical data. Outlines possible applications of AI for information security purposes, but does not comment on work-related impacts.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
64	Excell & Earnshaw 2015	Conference paper	AI; computing; IoT	Secondary literature review	Critical overview of the overpowering development of cognitive computing in its various forms, Moor's Law (increasing power of computers), the threat of the 'singularity' phenomenon (that is, cleverer machines than humans), the need of relevant education in the UK, implications of advanced technology in society, machine ethics.	Useful description of the types of cognitive computing and discussion on changing roles of humans and machines, impacts on society. No empirical data.	2
65	Fahdi 2013	Conference paper	AI; automated forensic examiner (AFE)		Proposition of an AFE that is based on AI and can be used to sort and identify relevant artefacts regarding cybercrime. Discussion on possible applications with a cloud-based infrastructure. Need of future scientific validation.	Example for potential applications of AI to certain type of work/professions.	2
66	Felita & Suryanegara 2013	Conference paper	5 generation mobile technology (5G)	Secondary literature review	Review of 5G and opportunities for/challenges of technological innovation – security, network, technological implementation and application.	–	2
67	Fischer 2012	Peer-reviewed journal	Service robot	Conceptual essay; opinion	Takes a work science perspective on the psychology of tasks.	No empirical evidence.	4

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
68	Fourie 2016	Magazine article	Vague on technology – touches on AI, IoT, autonomous vehicles	Opinion piece by South African economics academic	Reviews concern that new technology will have a negative impact on employment levels. Repeats Autor 2015 perspective (see above) – that automation both substitutes for and complements labour. Biggest threat of automation is to low-skilled work still.	–	5
69	Frank 2016	Conference paper	AI; ethics; meta-ethics	Secondary literature review	Discussion of some of the meta-ethical theories and moral philosophy in the context of AI (that is, creating an AI that makes moral judgements).	Focus is primarily on the need and difficulties of designing ethical AI machines, not on the impacts of (ethical) technology on work.	2
70	Frude & Jandrić 2015	Peer-reviewed journal	AI; companion machines; intimate machines	Narrative in the form of discussion between a clinical psychologist and an educationist	Discussion on the human–machine interaction including topics such as ‘animism’ (the tendency to regard non-living entities as living and sentient), intimate machines, ‘virtual pets’, ‘artificial personality’, ethical and social issues, possible clinical applications of such systems in both physical health and mental health, potential dangers.	Combination of academically informed opinion and speculation. Introduces a variety of related concepts and important topics regarding human–machine interaction and work applications of AI.	3

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
71	Gilbert et al 2015	Peer-reviewed journal	AI; mobile health; gerontechnology	Secondary literature review	Overview of the concepts of mobile health (mHealth) and gerontechnology (technology for elderly patients). Discussion on the factors predicting/facilitating the adoption of new technology.	Useful insights about emerging applications of new technology and even new scientific/practitioner areas, facilitators of technology adoption in the healthcare sector.	2
72	Goeldner et al 2015	Peer-reviewed journal	Care robots for elderly or people with mental or physical disabilities	Literature review and study of patents issued (1974–2009) using social network analysis	Country most active in care robotics regarding patent applications and publishing is Japan. South Korea and China also active. US – Carnegie Mellon University most internationally active in this area.	Gives overview of where research is taking place, but less focus on what the outcomes of that research has been.	2
73	Gombolay et al 2015	Conference paper	Robots; human–robot teaming	Experiment (human–subject) with 17 people	Demonstration of how humans team/co-work with robots, what factors and preferences are core for these teaming choices.	Useful information about possible moderators and mediators regarding human–machine interaction, changing work roles.	1
74	Haen et al 2012	Peer-reviewed journal	AI; machine learning; autonomic computing – automation of system administration tasks	Experiment/prototype testing	Introduction of a framework using AI and machine learning to monitor and diagnose Linux-based systems and their interaction with software.	How AI could be applied to the work of system administrators.	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
75	Hanson et al 2011	Conference paper	AI; ambient intelligence for analysing/monitoring daily lifestyle data to support elderly dementia patients	Secondary literature review and description of a prototype/wireless health technology	Introduction of a wireless technology platform using ambient, AI to contextualise data for recognition of activities of daily living of dementia patients.	Using AI to improve health and life of an ageing population. Major focus on the technological design. No empirical data.	2
76	He et al 2013	Peer-reviewed journal	Decision support systems in transportation management	Outlines architecture for group decision-making system and considers application in rail industry	Outlines group decision-making architecture and argues it has potential to provide operational efficiency in rail industry – these conclusions speculative.	Primarily about technicalities of group decision-making architecture. But discusses implication of use in railway sector.	5
77	Hengstler et al 2016	Peer-reviewed journal	AI; automation; trust	Empirical (qualitative) analysis of 9 case studies from the transportation and medical technology industries	Explanation of the dichotomous constitution of trust in applied AI – a combination between trust in the technology and trust in the innovating firm & its communication about the technology. Suggestions of approaches to increase trust in technology.	Findings regarding trust in technology, mediators and moderators of the technology–worker relationship, impacts of new technology on individuals and society.	1
78	Hilóvská & Koncz 2012	Peer-reviewed journal	AI and data mining	Secondary analysis of global data on utilisation of AI in financial sector work	Considers extent to which AI and data mining systems can be used in financial service work. Examines a range of applications and extent to which they are used across the world. Conclusion is that such systems are starting to be used quite extensively. No data on impact on employment or skills at work, and so on.	Considers where these applications can be used, which are argued to be extensive.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
79	Holloway et al 2013	Peer-reviewed journal	Sales force automation technologies	Survey-based study of sales staff in pharma and publishing MNCs	Investigation of how use of SFA technology affects performance. Various factors found to mediate relationship (learning, customer orientation, relationship quality).	–	1
80	Howley & Rosé 2011	Conference paper	AI; human–computer interaction	Secondary literature review; position paper	Proposed a (multi-dimensional conversation analysis) framework to explain a variety of new forms of human–computer interaction.	The human–computer interaction is presented in a very technical way that does not reveal much about potential impacts of technology on workers.	2
81	Huijnen et al 2016	Peer-reviewed journal	Robot interventions with children with autism spectrum disorders (ASD)	9 focus groups with 53 autism spectrum disorder (ASD) professionals and systematic literature review yielding 36 articles for in-depth review.	Robots can potentially be applied to a large scope of objectives for children with ASD. This objectives overview functions as a base to guide development of robot interventions for these children. Identifies robot-based research that could potentially address objectives identified.	Practitioner perspectives on possible applications of robots for ASD.	2
82	Iliadis 2014	Review of a special (journal) issue on AI and innovation	AI; machine learning; artificial neural networks; fuzzy logic, smart clustering; classification	(Editorial) review	Outline of conference proceedings on the applications of a variety of advanced technologies to various areas/industries – bioinformatics, biomedicine, medical image analysis, education, engineering, e-services.	Good summary of possible applications of advanced technologies.	2
83	Ilsever 2014	Peer-reviewed journal	Sales computerisation	Untested conceptual model	Speculative paper about role of transformational leadership in facilitating and supporting technology implementation.	–	5



No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
84	Ira 2016	Newspaper article	AI law app called ROSS	Brief opinion piece	Briefly considers scope for use of AI in law. May have role in supporting lawyers, but unlikely to replace lawyers except for very routine work.	–	5
85	James et al 2013	Peer-reviewed journal	Specific process automation technology	Pre- and post-implementation survey of pharma worker stress levels in one Welsh NHS hospital. Also qualitative focus groups	Automation had a positive impact, reducing stress levels, improving work environment (physical redesign of pharmacy), workload allocation, role expansion and work–life balance. Some stress with machine error, and some technicians felt automation devalued their skills.	–	1
86	Jang & Kim 2015	Conference paper	Developing model for relationship-based personalisation for robots	Theoretical model – early conceptual development stage	Very limited progress – preliminary conceptual model presented.	Research in progress paper.	2
87	Jeong et al 2014	Peer-reviewed journal	Service robots for children’s learning	Experiment. Proof of concept, 3 use case examples combining smartphones to control service robots	Propose that new models can provide customised education based on each child's interests, background knowledge and understanding abilities. Can be used to increase children’s interest and maintain their attention. Can help teachers provide active intervention by providing additional information and swift responses.	Little evidence of data to assess improvement in learning although robot systems appear effective.	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
88	Jeske & Santuzzi 2015	Peer-reviewed academic journal	Electronic worker performance monitoring technology – via video, data entry, voice recording	Survey-based study of student workers	Found that experience of close employee monitoring had a strong negative impact on various aspects of worker experience – including job satisfaction, commitment, organisational citizenship behaviour.	–	1
89	Johnson 2015	Peer-reviewed journal	Autonomous technology – IT/technology with ability to make decisions/judgements	Philosophical, speculative article on morality of technology/IT and who is responsible	Central focus on moral/ethical question of who is responsible for consequences of technology. Argued that it is designers/users of technology. Questions whether this will remain the case with future autonomous technologies – answer argued to still be the same.	–	5
90	Kaivo-oja et al 2015	Conference paper	New technologies; IoT; big data; AI; robotics	Secondary literature review	Discussion of the nature/role of the internet of things (IoT), big data and other key technologies in relation to knowledge management in organisations, impacts of technology on organisational culture and processes. Potential mediators and moderators of the impact of technology on work/organisations.	Technology development and its transformational role for (smart) organisations and society.	2
91	Khosla et al 2013	Conference paper	Assistive communication robot for the elderly	Experiment, proof of concept; 3 field trials	Elderly patients in field trials enjoyed playing games (for example bingo) with assistive robot, potentially removing the need for the carer to call the numbers.	Field trials last 3 days.	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
92	Kile 2013	Peer-reviewed journal	New technology; AI; automation; computers	Secondary literature review	Overview of the development of new technology (AI; automated machines; computers) and its role/effects on society (for example changing social behaviours, cybercrime, remote warfare, human identities, and so on).	Useful references to potential global (for example societal) impacts of new technology.	2
93	Kim et al 2014	Peer-reviewed journal	Smart TV systems	Experiment; technical paper looking at memory usage optimisation in smart TVs	Prototype system for load balancing of memory. Experimental design and test.	Proof of concept; prototype design not implemented.	1
94	Kim et al 2015	Peer-reviewed journal	Robotics kits were used to teach the student teachers about robotics	16 students on elementary pre-service teacher education course (a) 16 students' reports of their STEM engagement and STEM knowledge through surveys before, during and/or after robotics activities	Student teachers enjoyed learning about robots and it motivated them all to include robots in their teaching. Knowledge about robotics created a positive attitude toward STEM. About half of the student teachers included robots to teach their subject, for example English (as opposed to including robot building tasks, but only to teach robotics).	Focuses on use of robotics to improve teaching engagement but not to replace teachers – that is, hands-on skills that could be taught to students.	1
95	Kinne & Stojanov 2014	Conference paper	AI; robots; autonomy; lethal autonomous weapon systems (LAWS); ethics	Secondary literature review with several hypothetical scenarios	Discussion on the ethical aspects of building LAWS (moral/responsible LAWS), robo-ethics in terms of conflict resolution, prevention and policy-making.	Relevant to machine ethics and impact of advanced technology on work and society.	3

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
96	Kinshuk et al 2016	Peer-reviewed journal	ICT; learning technologies (machines); big data	Secondary literature review	Overview of the applications (for example autonomous decision-making and dynamic adaptive learning), as well as the transformational effects of learning machines and ICT on education/learning environments.	Examples of applications of new technology (learning machines) to learning and education.	2
97	Klintong et al 2012	Conference proceedings	Artificial intelligence techniques, for example artificial neural networks (ANN), fuzzy logic (FL), and genetic algorithms (GAs)	Literature review	Descriptive account of the technology and applications (the tables in particular are worth a look). Suggests that artificial intelligence provides cutting-edge scientific tools for reducing risks in managing product innovation projects.	Short conference paper that is a literature review. The method of this literature review is not explained.	2
98	Kon et al 2016	Trade journal	AI and big data	Case study of application in telecoms sector	Relevance to customer service roles in telecoms in relation to contract cancellation. Shows how the technology can reduce work of employees in tracking reasons for cancellations (not the work of talking to the customer). The technology can also syphon customer calls more effectively.	This paper gives an overview of a new conversation analysis solution and shows in detail how this technology would be applied and used in a telecom operation.	3

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99	Kraan et al 2014	Peer-reviewed journal	Generic computers	Analysis of European survey	Examined extent to which control of pacing in computer work affected workers' levels of stress and learning. Technological pacing was negatively related to stress, especially when autonomy was limited. Learning was enhanced when autonomy was greatest.	Has implications regarding attitude to computers and human-computer interaction.	1
100	Kreps & Neuhauser 2013	Journal article	AI	Analysis of e-health communication programmes and a 2-year pilot study with 30 patients and 4 providers.	Uses the concept of immediacy as a crucial factor in effective e-health communication programmes, and how AI can assist with this. Illustrates the finding with a case study on 'The ChronologyMD project', a project that supports people with Crohn's disease.	Evaluation of the technology in practice along a user-centred design approach.	1
101	Kudo et al 2015	Conference paper	Artificial intelligence for automating big data analysis in logistics	Experiment; proof of concept; goal of this research was to create an AI computer system that can create a model for predicting productivity from social-infrastructure-related big data.	AI computer system for analysing social infrastructure was applied to analyse work-log data in a logistics company, and the analysis results were used to improve the productivity in company's warehouse. The system can analyse data related to social infrastructure and improve productivity automatically.	By using system and implementing the AI analysis findings the productivity of the warehouse was increased by over 5%. Note: only experimental case.	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
102	Kuipers 2016	Source unclear	Robots and AI – morality and ethical considerations	Monograph – opinion based on selective use of literature	<p>Argues that robots and other AIs increasingly function as members of society, they should follow moral and ethical constraints, rather than determining their behavioural choices according to individual utility maximisation, that is, saving 5 people at the expense of killing 1 person.</p> <p>Provides recommendations for what should be included in an architecture for moral and ethical mechanism adequate for robots and other AIs.</p>	<p>Provides examples of moral scenarios.</p> <p>No empirical evidence.</p>	3
103	Lacity & Willcocks 2016a	Peer-reviewed journal	Robotic process automation (software application)	Single case study at O2. Interviews with staff at O2 (case study), Prism (RPA software company) and advisers (consultants)	<p>Developers of RPA don't need programming skills.</p> <p>Can be adopted outside control of IT department as software sits on existing systems.</p> <p>Estimated FTE savings are in the hundreds.</p> <p>15 processes automated using 160 'robots' ROI 600–800%.</p> <p>RPA was used to reduce FTEs in the outsourced relationship; no internal jobs were directly threatened. Once that job assurance was given, knowledge workers did not feel threatened by automation – they embraced it and view the 'robots' as teammates.</p>	Single case study.	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
104	Lacity & Willcocks 2016b	Peer-reviewed journal	RPA	Overview of all their various studies	Abstract focuses on argument that fears of large-scale job losses due to service automation may be overblown, and that in automating service provision, people and robots can work together without significant job losses.	–	1
105	Litwin 2011	Peer-reviewed journal	Electronic scheduling of meetings	Longitudinal archival analysis of data from one healthcare company in USA	Adoption of IT was related to organisation performance improvement, and performance improvement greater where level of employee involvement was higher.	Data on technology drivers: employee involvement.	1
106	Loi 2015	Peer-reviewed journal	Automation and digitisation of work in general	Comment piece	Develops a moral argument which is sweeping in nature. Assumes that current developments in automation and digitisation likely to lead to unemployment and deskilling. Because of negative effect of such change on workers, is immoral.	–	5
107	Lopez & Casillas 2013	Peer-reviewed journal – editorial	AI in industrial marketing (use of computers to help support strategic decision-making)	Literature review – introduction to special issue	Application of AI to marketing has been limited, and only increased since mid-2000s, with little academic research. Papers in special issue largely model-building and speculative, rather than evaluating real application of AI in marketing.	Introduction to special issue. Literature review and secondary analysis of historical and current research only.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
108	Lund 2011	Conference paper	Modular robotics in education and healthcare	Uses illustrations of modular robot experiments performed by the author and reported in other conference papers – details on method not provided in this paper. Descriptive overview of research activity	Proposes that to maximise social impact from robots need to empower users to be innovative and creative in their use of robots – modular robots may achieve this. Suggests modular technology approach can support contextualised IT education and product development in developing regions.	Robot application in developing countries for social impact. This paper is an overview of other work completed by the author reported elsewhere.	2
109	Lutz & Tamò 2015	Conference abstract	Robots	Abstract only; proposition based on literature	Proposes that regulators and engineers should work together to discuss ethical aspects of robotics.	Only conference abstract so very little detail on arguments.	4
110	Luxton 2014	Peer-reviewed journal	AI care provision (VR avatars, robots or voice systems for intelligent patient interaction), specifically in context of mental health	Review of current ethical guidelines to see if they account for AI issues	Examination of extent to which current ethical guidelines take account of use of AI care provision. They don't, and this is argued to be a problem, as ethical issues related to AICP argued to be distinctive. Potential benefits of AICPs reviewed – more reliable than humans, or allow increased access through smartphone-type provision. Implications for healthcare professionals argued to be potentially significant – replacement by and/or supervision of AICPS.	–	2



No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
111	Major et al 2014	Peer-reviewed journal	Simulated robots to help teach programming	23 student participants (aged 16–18) and 23 pre-service, and 3 in-service, teachers in UK. Mixed methods – pre- and post-questionnaires, in- and post-workshop exercises, and interviews	Method to encourage students to engage with learning programming by attempting to move a simulated robot to a destination through coding instructions. Students were more engaged with learning programming and increased learning levels compared with previous experiences of learning programming. Using programming tasks to move robots gives more purpose to the learning programming process.	Not suggesting robots are doing the teaching but provide a teaching device for students to work towards. Related to notion of robots contributing to healthcare therapies, for example for autism.	1
112	Mathers et al 2012	Peer-reviewed journal	Simulated space robots to help teach concepts related to STEM	Descriptive case study	Study of effectiveness of scenario-based teaching. Anecdotal evidence that students engaged more with STEM concepts	Not suggesting robots are doing the teaching but provide a teaching device for students to work towards.	3
113	Menager et al 2011	Peer-reviewed journal	Robot-assisted surgery (laparoscopy)	Survey with 33 assistants and 7 hospital residents in North Carolina	Suggests there is pedagogical value of using the robot for teaching surgical procedures and anatomy.	Not suggesting robots are doing the teaching but provide a teaching device for students to learn techniques.	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
114	Metzler et al 2016	Peer-reviewed journal	Humanoid robot companions for elderly in nursing home	Monograph – opinion based on selective use of literature	Summarises arguments for and against use of robot companions and how current AI systems model human mental life. Highlights ethics of ‘fake’ emotions being demonstrated by robots because robots cannot feel emotions, just mimic them – so essentially deceiving people. Argues for fundamental revisions in AI modelling of human mental life	Raises some philosophical points.	2
115	Michel 2012	Journal – not peer-reviewed article	Various emerging technologies, for example robots, robotic surgery, that may impact on geriatric medicine	Monograph – opinion based on selective use of literature	Very broad in points made.	–	4
116	Michelfelder 2011	Peer-reviewed journal	Nanotechnology	Opinion paper using literature to argue for the value of speculative thinking for philosophers regarding ICT ELSI	Role of philosophers regarding ethics, legal, social implications of new technology (ICT-ELSI). Speculation can ensure that policy developments associated with new technology consider ELSI. Speculation can offer new ways to consider ethical implications of technology. Speculation can challenge whether new technology should be developed.	–	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
117	Meyer 2011	Peer-reviewed journal	Advanced IT and software	Survey of workers in knowledge-intensive SMEs in Germany	Age of workforce affects adoption rate, where companies with younger workforces were more likely to adopt new IT and software.	–	1
118	Milano et al 2014	Magazine	Potential use of AI technology for policy-making	Monograph – opinion based on selective use of literature; ideas expressed in this article are a result of the EU FP7 project called ePolicy	Identified a number of AI techniques that can be effectively used to create support tools for policy-makers, for example game theory/simulation.  User acceptance is an important aspect to be considered as policy-makers hardly trust ICT tools that have been designed by people that do not have any expertise in the policy domain.	Summary article that describes a case study of application of the decision support system.	3
119	Mohagheh 2011	Peer-reviewed journal	AI-based reservoir models for simulation	Monograph – opinion based on selective use of literature. Descriptive review of the application of AI-based reservoir models based on case studies published and industry reports. No method section.	Advantages associated with AI-based reservoir models are short development time, low development cost, fast-track analysis and practical capability to quantify the uncertainties associated with the static model.	Descriptive summary paper.	3

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
120	Mohammadian (2012)	Conference paper	Fuzzy cognitive maps (FCM) for IT system disaster planning	Simulation experiment	Presents how FCM may help with IT disaster planning process.	Highlights impact of emerging tech will need IT disaster planning strategies to be updated.	2
121	Mokyr et al 2015	Peer-reviewed academic paper	Vague on technology, but talks of robotics and AI	No original data presented. Historical review of past perspectives, and speculation on future	Reviews historical perspectives from nineteenth century and early twentieth century where tech change produced anxiety about impact on employment levels and nature of work. Discusses consequences of new technology on employment levels and work skill.	–	5
122	Moniz & Krings 2014	Conference paper	Robot applications in manufacturing and healthcare sectors	Literature-derived opinion paper	Service robot sales relatively low but argues medical robots main growth area – ‘sales of medical robots increased to US\$1,495 million, accounting for 44% of the total sales value of the professional service robots.’	Provides calls for socio-technical and multi-disciplinary perspectives.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
123	Morel 2014	Magazine	Robots and AI for architecture	Monograph – opinion based on selective use of literature. Descriptive historical review of how architecture has been influenced by robots and what the future may hold	Three challenges facing automation in architecture and indeed automation in general. The first challenge is to ensure that digital and computational literacy is properly integrated into teaching at architecture schools. Second challenge is to test and develop new types of robot which would not only allow such a work to be replicated but which would move architecture forward. Third, much less specific, challenge implies a general understanding of the nature of robotics as computation applied to objects.	Historical account	4
124	Mubin et al 2014	Conference paper	Humanoid service robot to help with meetings	Proof of concept; experiment; 16 participants in meeting situation with humanoid robot	Participants preferred more active than passive robot engagement. Robot would be considered an assistant to help in the meeting, not replace participants. Suggesting potential for robot acting as helpers in meetings, providing prompts, listing information, giving basic information such as length of time remaining.	Experimental	1
125	Mtsweni & Burge 2014	Conference proceedings	Crowdsourcing platforms (such as Amazon Mechanical Turk)	Comment piece	Examines potential employment benefits for developing countries of utilising crowdsourcing work platforms.	–	5

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
126	Munske 2011	Peer-reviewed journal	Autonomous robot for mastoidectomy	Proof of concept; experiment; robot is subject to human control via a manual emergency stop button, it otherwise operates completely autonomously	On three specimens, surgeon's pre-operative plan was successfully executed by the robot with at least 96% of the targeted bone removed without damage to critical structures.  Recognise potential for clinical errors if wrong starting point chosen, so would have to be undertaken under supervision by human.	Potential for autonomous robot with human supervisor rather than assistive robot for human surgeon.	1
127	Naik & Bhide 2014	Peer-reviewed journal	Automation of knowledge work for genomic research	Speculative industry case study examples; no data collected; anecdotal comments	Unlocking data in literature in the field of genomics – Optra Bio-NLP, a web-based automated annotation system for scientific biomedical English-language text. The tool is aimed at identifying genes/variant and disease of interest using a context-specific analysis of PubMed abstracts.  Automation of intelligent knowledge work will prove significant in medical imaging in pathology and disease diagnosis.	Authored by Optra Health, one of several companies developing applications in medical machine learning.	5
128	Narula et al 2011	Conference paper	Mobile work crowdsourcing software for developing countries	Pilot study with 10 workers in India over 2 months	Possible to provide high-quality crowdsourced human OCR work on simple mobile phones.  Provides an alternative source of income that can be done anytime, anywhere for respondents to supplement normal job.	Social impact of crowdsourcing on work in developing countries.	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
129	Nezhad 2015	Conference paper	Cognitive work assistant framework to help with processing and linking information	Conceptual design of architecture	Presents an architecture for a cognitive work assistant platform targeting offering. Cognitive services for improving the productivity over communication.	Research in progress conceptual paper.	2
130	Nielsen et al 2016	Peer-reviewed journal	Robot vacuum cleaners in Danish eldercare	Qualitative, single case study [22] from a Danish municipality (Billund); 18 semi-structured interviews in 2012 and 2013	Technologist and managers liked the robots. Front-line staff were aware motivation was to cut costs but saw robots as improving working conditions, removing a mundane task. Clients held mixed views towards robot vacuum cleaning – some not happy with quality of cleaning, others enjoying the ‘on-demand’ nature of vacuuming. Key stakeholder groups likely to hold different views on use of robots.	Single case study.	1
131	Niu et al 2016	Peer-reviewed journal	AI and impact on geographical information systems	Literature review 1990–2014 with spatially explicit bibliometric analysis – social network analysis	Computer science and engineering were the most frequently used subject categories in artificial intelligence studies. The United States has the highest number of top research institutions in artificial intelligence, producing most single-country and collaborative articles.	Describes literature that has been published on AI using bibliographic data – does not analyse content of publications	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
132	Nomura et al 2011	Conference paper	Humanoid robot and robot anxiety – that is, anxiety of robot–human interaction	Experiment, focused on the robot’s behaviour of looking the other way while subjects answered questions; the experimental group consisted of 20 Japanese persons	Data suggest that if persons feel higher anxiety towards communication capacity of robots, their anxiety towards discourse with robots increases when the robot looks the other way during interaction with them, and decreases when the robot fixes the face – that is, robot behaviour may influence human behaviour of people anxious about robots.	Experiment only.	1
133	Noor 2011	Peer-reviewed journal	Refers to multiple emerging technologies and proposes development of an intelligent adaptive cyber-physical ecosystem for the aerospace workforce	Monograph – opinion based on selective use of literature	Ecosystem will amplify the human cognitive and perceptual abilities, significantly enhance both learning and the performance of complicated tasks, as well as facilitate and accelerate innovations. It will also address the needs of future entrants to the aerospace workforce, and provide timely, engaging, personalised/ collaborative, and tailored visual learning. The continuously expanding major components of the ecosystem are outlined in the paper.	–	2



No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
134	Ohlsson 2016	Journal	Intelligent tutoring system for constraint-based modelling	Monograph – opinion based on selective use of literature. Historical description of intelligent tutoring systems	Nine modes theory of learning might lead to a multiple modes theory of instruction (MMTI), a design for ITSs that are maximally effective because they teach to all modes of learning and hence can help the student capitalise on every learning opportunity.	Very conceptual and specific.	3
135	Olivier 2012	Journal article	'Virtual reality' or 'cyberspace'	Monograph – conceptual essay based on selective use of historical literature	Argues for importance of retaining a truly human identity and sense of relative autonomy from technology. Need to avoid our all-too-human propensity, to allow technological devices to inculcate heteronomy in us by conceiving of ourselves in their image (humans as thinking 'machines', and so on).	Philosophical perspective based on historical account of past experiences with technology.	2
136	Peña et al 2016	Journal article	Moriarty AI software tool – a tool that can generate big data near real-time analytics solutions (streaming analytics)	Descriptive explanation of Moriarty software tool and uses literature case studies to demonstrate how it may be applied	Software for end-user development of AI-informed big data analysis. Moriarty is an advanced software tool that allows the data scientist and software engineer to collaborate to design and generate rapidly big data near real-time analytics solutions (streaming analytics). With no lines of code to write, artificial intelligence and data applications can be built. Using a visual interface, data scientist works with algorithms and data transformations, while the software engineer works with the idea of services to be invoked.	–	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
137	Pieters 2011	Peer-reviewed journal	Artificial intelligence and cyber security	Monograph – conceptual essay based on selective use of literature	In AI, an expert system needs to be able to justify and explain a decision to the user. In information security, experts need to be able to explain to the public why a system is secure. In both cases, an important goal of explanation is to acquire or maintain the users' trust. Provides new framework for explanation-for-confidence and explanation-for-trust.	Conceptual paper – highlights importance of confidence vs trust in understanding explanations from expert systems. Also highlights differences between applications of AI vs information security.	2
138	Pinkwart 2016	Peer-reviewed journal	Artificial intelligence in education (AIED)	Monograph – conceptual paper based on selective use of literature to show current trends and possible future directions and challenges	Future predictions of AIED are presented in the form of a utopian vision and a dystopian vision. Seven challenges that AIED might have to face in the future: intercultural and global dimensions, practical impact, privacy, interaction methods, collaboration at scale, effectiveness in multiple domains, and the role of AIED in educational technology.	Describing impact of AI on education in respect of technology.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
139	Queenan et al 2016	Peer-reviewed journal	Computerised provider order entry (CPOE)	Survey-based analysis of 268 US hospitals	<p>Safety culture as mediator/moderator.</p> <p>Examines how patient safety culture affects implementation of CPOE in hospitals. More focused on factors affecting implementation rather than impact of CPOE on work or organisation performance.</p> <p>However, CPOE in tandem with safety culture improves information processing performance. Safety culture was found to affect implementation of CPOE.</p>	Tests specific hypothesis related to a specific technology.	1
140	Reeves 2016	Peer-reviewed journal article	Automated voice work/communication technology/systems	Secondary review of trends	<p>Considers social and economic impact of increasing use of voice recognition tool/systems for work, where people increasingly need to communicate with AI voice systems. Ethical issues and economic issues.</p> <p>Largely speculation on future trends. Automation systems replacing communicative workers, and need for increased interaction with technology. Caution, not unbridled optimism, is necessary – potential for creativity or alienation and labour displacement.</p>	–	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
141	Richert et al 2016	Conference paper	Humanoid and industrial robot to assist human completing tasks	Proposes experiment using virtual reality to examine how human interacts with different types of robot – human or industrial. Experiment results not reported.	Provides basis for experiment design but not findings available.	Research in progress paper with no findings available. Some limited conceptual development regarding human–machine interaction.	2
142	Russell et al 2015	Peer-reviewed journal	AI	Comment piece by 4 academics	Comment piece/s by 4 academics about various risks to society of increased use of AI – such as control over AI weapons, need for academics to shape debate on AI, concerns about uneven distribution of AI benefits.	Comment piece	5
143	Russo et al 2016	Peer-reviewed journal	Autonomous mobile robots equipped with environmental sensors to create environmental monitoring system for data centres	Proof of concept, experiment at two data centres in Italy. Tested navigation abilities of robots and whole application to collect environmental data.	Data collection and thermographic analysis performed inside the data centre room of Politecnico di Torino highlighted some issues regarding humidity control and isolation, which could be reported to the data centre management for action.	Proof of concept. Not clear if autonomous robot system is significantly better than existing monitoring systems.	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
144	Saccol et al 2011	Peer-reviewed report	Mobile and wireless technology	Systematic evaluation of mobile technology implementation	Analysis of the organisational consequences from the implementation of mobile technology. Case study of Brazilian public sector organisation. Helped reduce cost and improve speed of information communication, increase management control, reduce staffing levels (back office).	Impact of mobile technology implementation for organisations.	1
145	Samani 2016	Peer-reviewed journal paper	Methodology for measuring human affection for robots	Tested proposed measurement methodology through experiment where 20 people interacted with a robot and completed surveys on their feelings about it	Examines potentially interesting issue, which has social/work implications and which could be mediator/moderator of work application/use of IT. How to measure human affection towards and feelings about computers they interact with.	Methodology for measuring human emotion towards computers.	1
146	Samarakou et al 2014	Conference proceedings	Automated assessment tool for engineering education laboratories	Proposes an assessment tool, doesn't contain any empirical data which evaluates it	Proposed an automated assessment and evaluation tool for use on engineering education laboratories which accounts not only for quantitative aspects of assessment, but also qualitative.	Proposed assessment tool.	4

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
147	Sananès et al 2011	Peer-reviewed journal	Robot-assisted laparoscopy – da Vinci S robot	Single case study of aspects of setting up robotic surgery service. Used log book of contacts over 10-month period between December 2007 and September 2008.	<p>Robotic surgery in France is as yet still in its infancy and one of the main reasons is the difficulty involved in organising it.</p> <p>Robotic surgery needs regular practice but organising operating slots proved difficult and required 18-day lead time.</p> <p>Procedures and setup time decrease after first 20 operations because of familiarity with process.</p> <p>Robot-assisted surgery was found to be more expensive, but the hospital does not get a higher return from using it.</p>	<p>Organisation issues associated with implementing robot-assisted surgery – gives detail on costs and stakeholders involved.</p> <p>Single case study.</p>	1
148	Sayers et al 2014	Conference proceedings	AI for flood risk management evaluation in urban areas	Highly technical paper describing proposed mathematical model for evaluation of flood risks in England and Wales	Potential social impact/benefit of AI – use in flood risk evaluation.	Potential application of AI.	1
149	Schwartz et al 2016	Conference paper	Management and organisation of hybrid work teams involving people and intelligent machines	Focus on industrial work context in German manufacturing	Proposes a method for organisation of hybrid teams involving humans and intelligent machines. Suggests there are potential benefits from effective organisation.	–	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
150	Shahriar & Rahman 2015	Peer-reviewed journal	Smart homes; IoT; machine learning	Technical paper; experiment	Proof of concept for sensing data for energy optimisation in smart homes using machine learning.	Proof of concept; prototype design	1
151	Sheridan 2016	Peer-reviewed journal	Advanced robots (with AI elements)	Analysis of diverse brief anecdotes	Analysis of current challenges related to human–robot interaction (HRI). 4 types of HRI identified: human supervision of robots doing routine tasks; remote supervision of robots doing complex, non-routine tasks; automated vehicle with human passengers; human–robot social interaction – medical and education contexts. HRI research on current advanced robots is embryonic. Utility of advanced ‘humanoid’ robots yet to be proven.	–	4
152	Skulimowski 2014	Conference Paper	Role of humans in controlling expert systems	Considers various speculative scenarios regarding humans role in controlling complex AI systems	Examines challenges for humans of controlling and interacting with increasingly complex AI systems. Speculative paper, not evaluating real life situation	-	5
153	Sollner et al 2016	Peer-reviewed journal	All IS – from websites to IT systems	Extent to which trust is researched, and what questions on trust examined	Very broad-ranging article looking at extent to which trust in relation to IT/IS has been a theme in MISQ. Only one part of this is relevant – stream of research on trust in technology/IT – various factors identified as influencing user trust in systems – such as extent to which people rely on them.	–	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
154	Stalidis et al 2015	Conference proceedings	AI tool for tourism marketing	On tourists in Greece	Potentially interesting application of AI system for tourist marketing	Test of AI application	1
155	Sundararajan & Nitta 2015	Peer-reviewed journal	Intelligent tutoring system	Research in progress; proof of concept; prototype; exploration	The prototype of our tutoring system is under construction, with future studies and pilots planned.	Research in progress – theoretical at present.	2
156	Sutton et al 2016	Peer-reviewed journal	AI in accounting	Secondary review of research into use of AI in accounting over last 30 years	Relevant in terms of impact on profession – potentially significant impact on accounting profession – suggest use of AI in accounting has been gradually increasing.	Review article	2
157	Szalma & Taylor 2011	Peer-reviewed journal	Automation simulation task	Experimental study of student (USA) performance in simulated test	Effect of use of automation on performance and individual stress was shaped by some personality variables – complex model with multiple relations and moderations.	Student experiment	1
158	Taylor & Cotter 2014	Conference proceedings	AI in aviation	Secondary review and analysis of existing literature	Suggests potentially significant benefits from optimising human–computer interaction in aviation. Review of existing literature which speculates about future potential benefits.	Evaluation of secondary literature	2



No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
159	Tepeš et al 2015	Peer-reviewed journal	Factory of the future; smart tools in manufacturing	Survey of 58 responding buyers of custom-made tools in Slovenia and other EU countries. Survey of 21/50 responding Slovene producers of custom-made tools.	Increased online control of technical products from a distance, responsibility of technical products shifting from buyers to suppliers. Confirms trends that responding manufacturing firms may get benefits from smart tool, machine and special equipment as shift to supplier responsibility for these tools continues.	–	1
160	Thalmann et al 2014	Conference proceedings	3D and VR telepresence technology	Very brief discussion of some current advanced telepresence technologies being used in Singapore	Discusses how advances in IT which allow for 3D and VR can enhance telepresence communication and interaction between remote people.	Article outlining benefits of advanced telepresence technology.	3
161	Torras 2015	Peer-reviewed journal	Service and social robots	Monograph – opinion based on selective use of literature	Raises social and ethical issues. Charts the history of robots in sci-fi and how predicted some emerging developments. Considers notion of robot nannies.	–	4
162	Van de Merwe et al 2012	Peer-reviewed journal	Automation for air traffic controllers (decision-making support – gives advice on optimal solutions)	Real-time trial of new system with ATC	Impact of automation support on workload and performance of ATCs. Use of system increased performance accuracy without increasing workload.	–	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
163	Various 2016	Letters from readers to trade journal	Robots	Letters from readers to magazine	Pessimistic that robot usage for work may cause mass unemployment.	–	4
164	Verne & Bratteteig 2016	Peer-reviewed journal	Digitisation/automation of public services such as tax	Qualitative analysis	Proposes new digital system to allow citizens/users to submit tax returns in a way which they desire which takes account of new technology.	Focus primarily on public services from user point of view, but some relevance for public sector work organisation.	1
165	Vollmer et al 2014	Peer-reviewed journal	Humanoid robot	Proof of concept; experiment; 59 adult German-speaking subjects were instructed to teach a full-size humanoid robot equipped with a fully autonomous feedback behaviour (see the technical setup below) how to perform specific actions with eight different objects.	When teaching a learning humanoid robot, tutor's action demonstration strongly depends on the feedback that the robot gives. The feedback of the robot learner – in the form of action replication and eye gaze, indicating what has been understood – that influences repetition of action demonstration and modification of the tutor's movements.	Argues that in a future dominated by humanoid service robots we will need to be able to teach them easily and quickly – research explores how to do this and that robot feedback will influence how we teach them.	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
166	Wang et al 2013	Conference paper	Intelligent interactive robot for office environment	Proof of concept; experiment; testing for detected different types of human poses, for example leaning in.	Robot can understand human behavioural intention and decide whether to interact with a specific person.	Proof of concept	1
167	Weyer et al 2015	Peer-reviewed journal	Smart cars	Survey of drivers of technology-assisted cars in Germany	Report on study of human-computer co-operation in context of smart cars. Tested loss of control thesis, which suggests people may experience assisted technology as reducing their level of control. Thesis not proved – drivers experience assisted technology as positive and didn't experience significant level of malfunction.	Study of civilian car drivers	1
168	Willcocks et al 2015a	Working paper	RPA	Case study of implementation, use and development of RPA in Xchanging	Looks at implementation of RPA at Xchanging. Gives detail on implementation process, and impact on work and business. Has not resulted in loss of workers, as process automated has freed workers to do other things. RPA has benefited organisation by saving money, reducing errors and speeding up processes.	–	1
169	Willcocks et al 2015b	Working paper	RPA	Summary of all case studies	Describes character of change process required to make implementation of RPA successful.	–	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
170	Willcocks et al 2015c	Working paper	RPA	Case study of implementation, use and development of RPA in European utility company	At utility, RPA involved automation of routine data processing admin work that had previously been outsourced to India. This created significant cost saving. For the routine work involved this suggests RPA was used to replace workers.	Implications for automation of routine work.	1
171	Wolbring 2016	Peer-reviewed journal	Robots and their impact on disabled people	Literature review of 236 academic literature and Canadian newspapers – uses framing analysis.	Little evidence of research or newspaper articles addressing impact of robots on the employability and employment situation of disabled people in Canadian newspapers and the academic literature covered.	Highlights some gaps in the impact of robots on work regarding disabled people.	2
172	Wood et al 2013	Peer-reviewed journal	Humanoid robot as interviewer of young children	Proof of concept; experiment 21 children in UK aged between 7 and 9 took part in this study comparing responses to robot and human interviewers	<p>Children were willing to interact with a robot in an interview scenario and did so in a similar way to how they interacted with a human interviewer.</p> <p>Amount of information that children provided to robot was also very similar to the information they provided to the human.</p> <p>Children more inclined to look at face of robot interviewer compared with human interviewer. Robot interviews took longer because of response time from robot. Children did not evaluate significant differences between talking to the robot compared with talking to the human.</p>	Authors suggest that in specific environments, for example police interviews using a robot to interview a person, could eliminate any of the subtle unintentional signs in body language that a human interviewer may give away, while the body language of the robot can be fully and precisely controlled by the interviewer.	1

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
173	Xu et al 2013	Peer-reviewed journal	Mobile service robots for elderly and disabled assistance	Proof of concept; experiment; human-robot collaboration to help human complete pouring task, that is, pouring a glass of water.	Establishes mechanism for human-robot collaboration for one task.	Technical development of robot-human interaction.	1
174	Xu et al 2014	Peer-reviewed journal	Computer lab simulation with on-screen tasks in multi-user environment	Student experiment, qualitative and quantitative analysis	Human trust in technology. Study of antecedents of user trust in (shared) technology. Identified 3 types of antecedent: technology (usability, competence, appearance), user (personality, confidence in tech), task (demands, outcomes). Differences between active and passive users (those with and without direct control) non-existent.	Looks at antecedents of trust in technology.	1
175	Yampolskiy & Fox 2013	Peer-reviewed journal paper	AI	No empirical data – philosophical argument	Considers issue of robot rights and challenges argument that robots should have rights equivalent to humans.	Rhetorical, philosophical paper.	5
176	Ye 2015	Peer-reviewed journal article	AI for secretarial work of pathologists	Description of potential use/benefits of specific technology prototype	Describes a prototype AI system for use by pathologists which undertakes the secretarial aspects of their work. Argued to have potential significant benefits for pathologists in terms of time-saving.	Describes potential benefits of a prototype technology.	2

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
177	Yu et al 2012	Peer-reviewed journal	Restaurant service robot	Proof of concept; experiment; robot picking up a plate and navigating around restaurant	Robot could automatically detect its current position. Robot finds object and is able to pick it up.	Prototype to help with restaurant serving tasks.	1
178	Zaghloul & Mahmoud 2016	Peer-reviewed journal	Robotic colorectal surgery	A case study. Ten Egyptian cases of colorectal cancer (age ranged from 30 to 67, 5 males and 5 females) were recruited from the period of April 2013 to April 2014. Robotic surgery was performed to all cases.	Preliminary results suggest that robotic-assisted surgery for colorectal cancer can be carried out safely and according to oncological principles. Blood loss was significantly lower for robotic surgeries than laparoscopic surgeries and thus may reduce the probability of transfusion.	Drivers – high cost of robotic surgery compared with existing methods and length of time to learn new techniques proposed as reasons for slow uptake of this technology.	1
179	Zeng 2015	Professional association magazine	AI	Comment piece	Comment piece by editor highlighting a number of key ethical issues related to increased AI diffusion/use, including: singularity and social disintegration, employment, accountability, privacy, human–AI dynamics, robot rights.	–	5

No	Reference	Source type	Technology	Method (incl. sample size)	Relevant findings	Limitations/comments	Extent of utilising empirical evidence
180	Zheng and Lee 2016	Peer-reviewed journal	Magnetic micro-robots	Selective review of current knowledge of magnetic micro-robots – no details of selection method for literature	Magnetic micro-robots can navigate in delicate and complex channels inside the human body, such as blood vessels and brain, for minimum invasive diagnoses and therapies, which cannot be done by the traditional interventional devices.	–	2
181	Ziuziański et al 2014	Peer-reviewed journal paper	AI in healthcare via dashboards	Reports on case studies of use of AI dashboards in healthcare context in Poland	Potentially interesting application of AI in healthcare context. Describes results of some experimental case studies.	–	1
182	Zurek et al 2013	Conference proceedings	AI for inventory control in libraries	Describes a prototype system for inventory control in libraries	Potentially interesting application of AI technology, but speculation based on prototype technology.	–	3



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