COM6655 Professional Issues
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The Social Context of Computing (Part 2)

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Overview

- Technological and Social Change
- IT and Employment Change
- Impact of IT on working conditions
- Information management and sociotechnical systems design
- Computers and social relationships

Does it pay?

- Evidence suggests that huge investments made in computer technology may not pay off.
  - US investment in computers grew at a rate of 24% per year during the 1980s, but there is no evidence of increased productivity in the economy over this period.
- Some critics argue that this productivity paradox actually results from:
  - Inappropriate ways of measuring productivity;
  - Steep learning curve of the new technology.
- Others argue that the problems are real:
  - Software is often poorly designed;
  - Benefits can be lost in an organisational context.

Example: word processors, pros and cons?

Word processors - pros

- Word processing provides obvious benefits:
- Mestakes can be easilt coerrected;
- Documents and templates can be saved and re-used;
- Grammar can be improved.
- Machine learning is now taking auto-completion to a new level

Word processors - cons

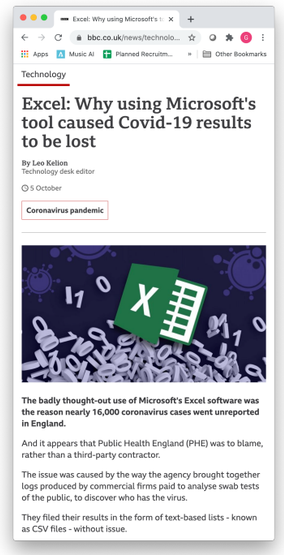
- Users make many more revisions than they otherwise would do, but without necessarily improving quality;
- Can be difficult to master (for average user);
- Too many features, many of which are never used;
- Little compatibility between packages.
- Features may be of less use than they appear. Spell checkers cannot detect every error, so do not remove the need to read through the document.
- Disk failures and crashes can be catastrophic; computer systems are not as resilient as paper-based systems.

Problems with computer software

- Software can be hard to use because computer-literate designers lose the perspective of novice users.
- Software often facilitates tasks that are marginal:
  - a small business uses computerised databases when they would be better served by a card index;
  - spreadsheets are used to experiment with different scenarios (e.g. effect of inflation on business forecasts) but often these are of little utility.
- People are resistant to automation of some activities
  - meeting schedulers that keep diaries for a group of people.
- Total reliance on computer software can be dangerous
  - up to 95% of spreadsheets in use contain errors.
  - in a 1990s company buy-out, the buyer overspent by 10 million dollars due to a spreadsheet error (Computing, 28th August 1997).

Recent example

- 16,000 coronavirus cases unreported in England in October 2020
- Due to use of XLS format in Excel which has a limit of 65k records
- Cases over this number were simply missed off
- https://www.bbc.co.uk/news/technology-54423988



Technology

Excel: Why using Microsoft's tool caused Covid-19 results to be lost

By Leo Kelion
Technology desk editor

5 October

Coronavirus pandemic

The badly thought-out use of Microsoft's Excel software was the reason nearly 16,000 coronavirus cases went unreported in England.

And it appears that Public Health England (PHE) was to blame, rather than a third-party contractor.

The issue was caused by the way the agency brought together logs produced by commercial firms paid to analyse swab tests of the public, to discover who has the virus.

They filed their results in the form of text-based lists - known as CSV files - without issue.

Organisational issues

- Productivity may not be increasing because of the way that computers are used in the workplace.
  - A lot of time may be spent creating high-quality internal reports - without productivity gains.
  - Email and text is (often) slower than a phone call.
  - If people are doing the wrong things when they automate, they simply do the wrong things faster.
- Conclusion: application of computer technology does not inevitably lead to productivity gains.
- Getting results usually involves redesigning the work process before computerisation.

IT and power

- 'Knowledge is power'
- IT does tend to increase the differences between those with power and wealth and those without.
- In corporations: managers can monitor keyboard activity, phone conversations, emails of employees and can use data mining to profile customers, employees and potential recruits.
- Access to IT technology is not universal – are developing countries at a disadvantage?
- https://www.theatlantic.com/ideas/archive/2020/10/fight-tame-big-tech-has-finally-begun/616800/

The antitrust suit, which alleges that Google has abused its search monopoly to squash competition, is the beginning of the end of a lawless era, when Big Tech could get away with whatever bolstered its profits and power.

IT and Employment Change

IT and Employment Change

- Forecasts of the consequences of IT for employment levels are controversial.
  However, the following trends are generally agreed:
  - Shift of employment from the primary economic sector (agriculture, forestry, fisheries) to the secondary sector (extractive industries such as mining) to the tertiary sector (manufacturing).
  - Reduction in 'core' manual and production occupations (construction, mining, farming), increase in 'peripheral' ancillary, administrative and professional jobs.
  - Continued reduction in lifetime working hours.
  - The 'information sector' (which produces information goods and services as final output) now dominates employment (more than half of all workers in the US).

Job losses due to IT

- It is hard to quantify the impact of IT on employment.
- Most case studies analyse employment changes in existing sectors of the economy: they often predict reductions in employment, or 'jobless growth' (reduced costs and increased productivity without increased employment).
- But future employment may also be boosted by new areas of economic activity due to IT.
  - Until quite recently, relatively few job losses can be attributed directly to technological change. Other factors are more influential, such as heightened competition and falling demand during periods of recession.
  - In most countries, only 10-15% of the working population are employed in the manufacturing sector. Hence, the trend towards automated manufacturing will not cause a major increase in unemployment.

Local Analogy: Sheffield Steel

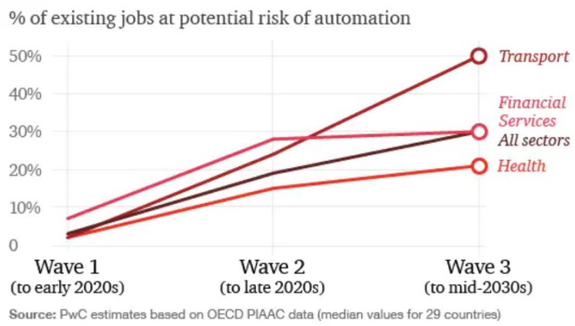
- Decline of steel industry in 1980's
  - more steel is now produced …
  - … but with fewer employees
  - Focus on specialised metals and advanced manufacturing
- Will the same happen in other industries as new technology is introduced?

https://ianswalkonthewildside.files.wordpress.com/2015/03/a-sheffield-forge-on-the-river-don-1907.jpg

PWC Report

https://www.pwc.co.uk/services/economics-policy/insights/the-impact-of-automation-on-jobs.html

Financial services jobs could be relatively vulnerable to automation in the shorter term, transport jobs in the longer run



Source: PwC estimates based on OECD PIAAC data (median values for 29 countries)

Automation will vary significantly by industry sector

Retraining/redeployment

- Job losses due to IT may be offset in the long term by retraining and redeployment.
- Problems with retraining:
  - Not all people can be re-trained;
  - Successful retraining requires government funding;
  - During 1980s, estimated that 400,000 needed retraining in US: only half could be retrained by federal programs, whose budget was subsequently halved.
- Sheffield context: two-tier workforce

Women and IT

- Concentration of IT in clerical jobs is likely to have a disproportionate effect on women, since it is traditionally in this area that women have found part-time and full-time work.
- Gender imbalance
  - Computing tends to be a male dominated profession.
- This problem may be traced back to education:
  - At 'A' level in England and Wales, males taking computer studies have outnumbered females by 4:1;
  - In the US, males taking secondary school courses in computing have outnumbered females by 2:1 across all states.
- Intriguingly, the mathematical and computer skills of women tends to improve when they are taught in a single-sex setting.

Tracy Camp (2002)

The Incredible Shrinking Pipeline. *Comms ACM* 40(10).

- "Although women make up 50% of high school computer science (CS) classes, the percentage of bachelor's degrees in CS awarded to women in the 1993-94 academic year was only 28.4%. At the graduate level, for the academic year 1993-94, the percentages of degrees in CS awarded to women dropped even further: 25.8% at the M.S. level and 15.4% at the Ph.D. level … The percentage of bachelor's degrees awarded in CS to women decreased almost every year over the last decade … There are a number of reasons why we need to improve the percentage of degrees awarded in CS to women. In short, there is a critical labor shortage in CS and, although women are more than half the population, they are a significantly underrepresented percentage of the population earning CS degrees."

Women in computing

- 1985
  - 37% Computer Science undergraduate degree recipients were women
- 2010
  - 57% of undergraduate degree recipients were women
  - 18% of Computer and Information Sciences undergraduate degree recipients were women
  - 14% of Computer Science undergraduate degree recipients at major research universities were women
- 79% decline in the number of first-year undergraduate women interested in majoring in Computer Science between 2000 and 2010

Recent UK figures

According to Engineering UK 2018 the following are the latest statistics interpreted from the report by WES:

- 12.37% of all engineers are women in the UK. [22]
- 21.80% women work in the engineering sector (incl. engineers) [22]
- 46.4% of girls 11-14 would consider a career in engineering, compared to 70.3% of boys [22]
- 42.0% of girls 14-16 would consider a career in engineering compared to 66.0% of boys [22]
- 25.4% of girls 16-18 would consider a career in engineering compared to 51.9% of boys [22]
- 22.2% of students starting A Level Physics in 2018 were female. [22]
- In all STEM A-Levels except Chemistry more girls get A*-C grades than boys – including Further Maths, Maths, ICT and Design and Technology. [22]
- Girls and women make up less than 18% of higher apprentices in engineering and manufacturing, and 7.4% of all engineering apprentices. [22]
- 79.8% of female engineering students get a First or Upper Second, compared to 74.6% of male students. [22]
- 60.7% of female engineering graduates enter full time work, compared to 58.8% of all female graduates and 61.9% of male engineering graduates (57.7% of all male graduates). [22]
- Female engineering graduates are more likely to enter full-time work (61% vs 59%) and less likely to enter part time work (8% vs 12%) than all female graduates. Female engineering graduates are also less likely to enter part time work than all male graduates (11%). [22]

https://www.wes.org.uk/content/wesstatistics

Robots and unemployment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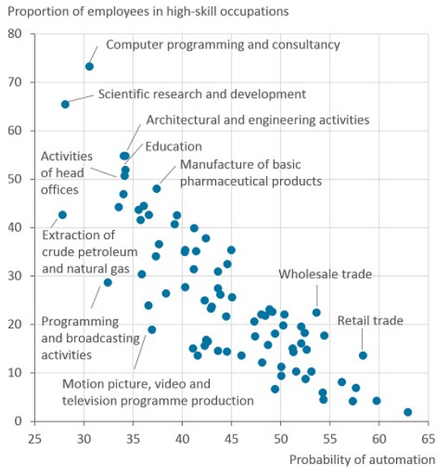
This article is more than 3 years old
Robots threaten 15m UK jobs, says Bank of England's chief economist
Results of the Bank's study, Andy Haldane said, suggested that administrative, clerical and production tasks were most at threat
▲ A robot on display at the China International Industry Fair in Shanghai. The Bank's chief economist said technological advances since the 18th century had always had the effect of widening the gap between the skilled and unskilled. Photograph: Zhang Jiansong/Xinhua Press/Corbis
Larry Elliott Economics editor
Thu 12 Nov 2015 18.23 GMT

https://www.theguardian.com/business/2015/nov/12/robots-threaten-low-paid-jobs-says-bank-of-england-chief-economist

Automation of work

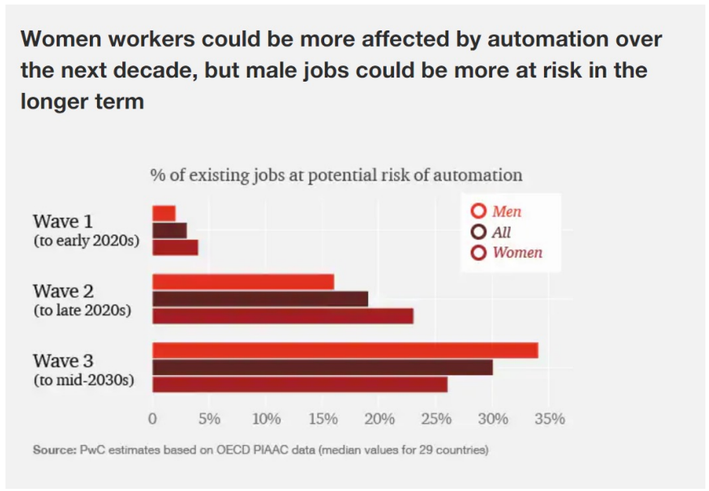


The lower the skillset involved, the more likely it is that a job will be automated.

https://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/employmentandemployeetypes/articles/theprobabilityofautomationinengland/2011and2017

PWC Report

https://www.pwc.co.uk/services/economics-policy/insights/the-impact-of-automation-on-jobs.html



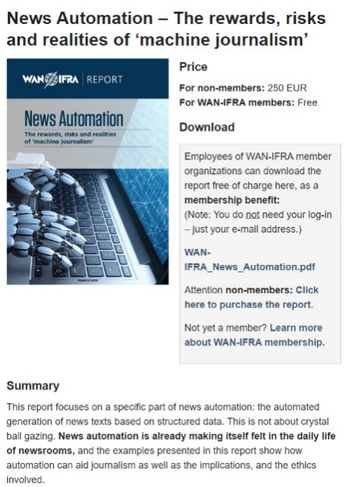
IT in the service industry


Forbes
21,378 views | Jun 21, 2018, 10:00am
Meet The World's First Fully Automated Burger Robot: Creator Debuts The Big Mac Killer
Christina Troitino Contributor
Food & Drink
I write about the business and future of food & agriculture.
TWEET THIS
Creator is debuting a burger concept that seems bent on using robots to inject more humanity and customer democracy
Here's what you'll need to know before trying the internet's favorite Rube Goldberg burger machine
After years of hype, Creator (formerly Momentum Machines) will be debuting its

- We have already become familiar with IT in the service industry
  - ATMs
  - Self-service tills in supermarkets
  - Fast food
- In service sectors of the economy, the pattern of employment is likely to change significantly as IT becomes more integrated.
- Emphasis will probably be placed on 'front-office' personal attention, while the traditionally information-intensive 'back-office' activities will be automated.

IT and office jobs

- Martin Ford: *Rise Of The Robots: Technology and the Threat of a Jobless Future*
- “Some of the people most threatened are what we might call office drones: people who sit in front of computers doing relatively routine, formulaic things. If your job is to produce the same kinds of reports again and again, software is getting smarter and better at doing that. We already have lots of examples, even in journalism. There’s smart software that is able to write basic news stories. Lots of white-collar jobs held by college graduates are going to be threatened.”



News Automation – The rewards, risks and realities of ‘machine journalism’

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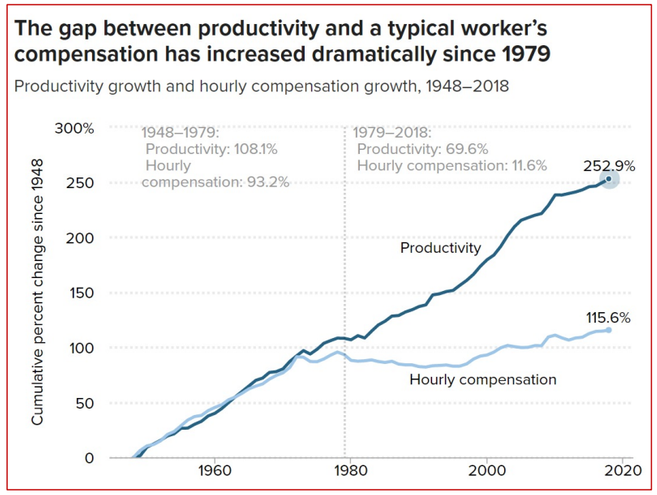
Summary

This report focuses on a specific part of news automation: the automated generation of news texts based on structured data. This is not about crystal ball gazing. **News automation is already making itself felt in the daily life of newsrooms,** and the examples presented in this report show how automation can aid journalism as well as the implications, and the ethics involved.

https://www.wan-ifra.org/reports/2019/03/08/news-automation-the-rewards-risks-and-realities-of-machine-journalism

Productivity v. Wages



Economic Policy Unit: https://www.epi.org/productivity-pay-gap/

Effect on world economy?

- Stagnation?
  - “As you eliminate workers and people become unemployed or their wages fall, consumers will have less purchasing power to buy the products and services produced by the economy. As a result, there will be less and less demand.”
- Boom?
  - “The use of robots will reduce the need for humans to carry out dehumanising work, leading to a happier and more effective workforce. Productivity will increase, prices will drop, work will become easier, life will improve.”

Impact of IT on Working Conditions

Taylorism and deskilling

- In the 1890s F. W. Taylor performed 'time and motion' studies of work processes. These involved:
  - Splitting tasks into component actions;
  - Timing each action;
  - Redesigning actions to reduce the time requirement.

Taylorism

Frederick Taylor (1856-1915)
"Scientific management"

'Taylorism' results in production systems in which individual jobs are simple and relatively unskilled.

The introduction of IT into the workplace can have a similar effect to Taylorism; previously skilled tasks effectively become 'de-skilled'.

But is it all bad?

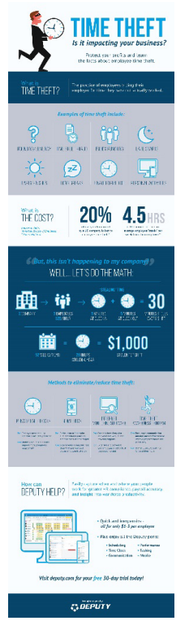
Effects of IT and automation

- **Deskilling**
  - Conceptual tasks built into computer algorithms, or transferred to a few specialists
- **Upgrading**
  - Automation of routine and repetitive tasks
  - Growth of white collar work, and lowest level clerical workers retrained

Performance monitoring

- Employee performance monitoring is inherent in the Taylorism approach; human operators are measured in the same way as raw materials or components.
- Performance monitoring is also seen as a means of identifying 'time thieves'; employees who take too many breaks or leave work early. Can also help identify other forms of theft.
- "The American Society of Employers estimates that 20% of every dollar earned by a U.S. company is lost to employee theft."

Reported at:
https://www.prnewswire.com/news-releases/safe-communications-inc-completes-acquisition-of-control-of-northsight-capital-inc-123013583.html



https://www.deputy.com/blog/time-theft-infographic

Monitoring techniques

- The simple timing advocated by Taylor has now been replaced with more sophisticated monitoring:
  - closed circuit television;
  - keystrokes per hour (US company 'Electronic Banking Systems' sets target of 8500 keystrokes per hour);
  - rate of scanned goods in supermarket checkouts;
  - monitoring of telephone calls;
  - 'active badges' which track individual employees.

Practice and Experience

The Active Badge Location System

ROY WANT, ANDY HOPPER, VERONICA FALCÃO and JONATHAN GIBBONS
Olivetti Research Ltd. (ORL), England

A novel system for the location of people in an office environment is described. Members of staff wear badges that transmit signals providing information about their location to a centralized location service, through a network of sensors. The paper also examines alternative location techniques, system design issues and applications, particularly relating to telephone call routing. Location systems raise concerns about the privacy of an individual, and these issues are also addressed.

Categories and Subject Descriptors: B.4.1 [**Input/Output and Data Communications**]: Data Communications Devices—*receivers (e.g., voice, data, image), transmitters*; I.4.1 [**Information Systems Applications**]: Office Automation—*equipment, time management, (e.g., calendars, schedules)*; H.4.3 [**Information Systems Applications**]: Communications Applications; K.6.5 [**Management of Computing and Information Systems**]: Security and Protection

General Terms: Design, Experimentation, Human Factors

Additional Key Words and Phrases: Active badges, location systems, PBX, privacy issues, tagging systems

1. INTRODUCTION

Efficient location and coordination of staff in any large organization is a difficult and recurring problem. Hospitals, for example, may require up-to-date information about the location of staff and patients, particularly when medical emergencies arise. In an office building, a receptionist is usually responsible for determining the location of staff members; in some organizations, public-address systems are provided to help a receptionist locate employees but, more frequently, a telephone is used to contact all the possible locations at which the required person might be found. These solutions can

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Problems with monitoring and deskilling

- Monitoring may not improve productivity at all:
  - increased stress and atmosphere of mistrust;
  - absenteeism is increased;
  - higher turnover of employees;
  - staff may work at minimum acceptable level for fear that better performance will lead to raised expectations.
- Deskilling often reduces employee motivation; work is monotonous and dispiriting.

The Hawthorne studies

- Taylorism is now widely regarded as flawed. So-called 'Hawthorne Studies' of late 1920s demonstrated importance of social relationships in the work place.
- The Hawthorne studies were carried out by the Western Electric company at their Hawthorne plant in the 1920's. Initially, the study focused on lighting.
- Two things emerged from the initial studies:
  - **The experimenter effect**: making changes was interpreted by workers as a sign that management cared, and more generally, it just provided some mental stimulation that was good for morale and productivity.
  - **The social effect**: it seemed that by being separated from the rest and being given special treatment, staff developed a certain bond and camaraderie that also increased productivity.

Interpreting the findings

- **Conclusion**:
  It is the way that computerisation is used which is important, not the use of computers per se.
  - Computers can be employed in a sensitive and useful way, e.g. the drudgery of bookkeeping has been removed by spreadsheets, so that accountants can concentrate on analysis and financial modelling.
  - Computers can also be used to monitor and increase the stress on employees, e.g. call centres.