Looking Beyond the Technology

It can be difficult, in all walks of life, to *'see the bigger picture'* sometimes. This can particularly be true of scientists and engineers developing new technology. Similarly, trying to *predict* future development will be hampered by only considering the technology itself and not its wider impact.

Two cautionary observations (in relation to big data):

- Building big data applications doesn't take place in a vacuum, neither does trying to predict future development. Other key technological 'drivers' (*artificial intelligence, smart – 'Internet of Things' – devices, robotics & automation* and *24/7/anywhere global connectivity*) all impinge on this. Each of these, independently, would have far-reaching implications over the next 5-10 years; but they won't be acting independently: they'll be working together – making for a challenging, complex, potentially both exciting and alarming future.
- Furthermore, all of these technologies can't be considered purely from the technological perspective. They will have an impact on *us.* This impact is multi-dimensional and ranges from the ethical to the environmental. In addition, these impacts could be positive, negative, something in between or even impossible to judge at this point in time. This complicates the picture by another order of magnitude and makes all responsible development and long-term planning a real challenge.

The 'STEEPLED' Model

A handy tool for keeping in mind as much of the bigger picture as possible is the 'STEEPLED' model. This began several decades ago as 'PEST Analysis' [https://www.groupmap.com/map-templates/pest-analysis/] and has been extended since to become:

> **S**ocial
> **T**echnological
> **E**conomic
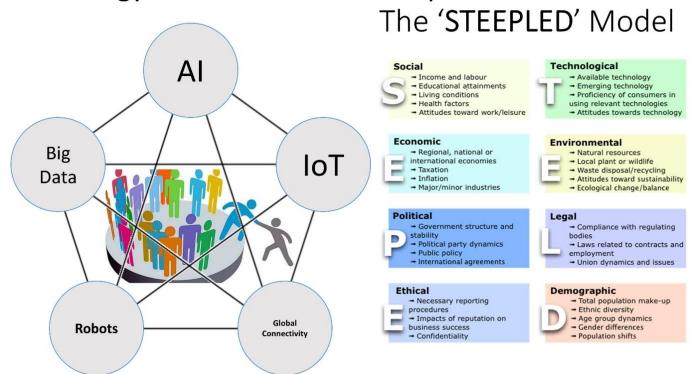> **E**nvironmental
> **P**olitical
> **L**egal
> **E**thical
> **D**emographic

See the diagram for a breakdown of each of these general terms but, yes indeed, there's quite a lot of overlap between these headings and it can sometimes be a bit arbitrary as to where to put a particular comment: that doesn't matter. Whilst there's also no particular, formalised way of *applying* the STEEPLED model, it provides a useful aide-memoire or check-list for ensuring you at least think about a variety of points of view – potentially including some critical issues – that might be otherwise overlooked

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Technology drivers and Wider Impact
The 'STEEPLED' Model

Social
→ Income and labour
→ Educational attainments
→ Living conditions
→ Health factors
→ Attitudes toward work/leisure

Technological
→ Available technology
→ Emerging technology
→ Proficiency of consumers in using relevant technologies
→ Attitudes towards technology

Economic
→ Regional, national or international economies
→ Taxation
→ Inflation
→ Major/minor industries

Environmental
→ Natural resources
→ Local plant or wildlife
→ Waste disposal/recycling
→ Attitudes toward sustainability
→ Ecological change/balance

Political
→ Government structure and stability
→ Political party dynamics
→ Public policy
→ International agreements

Legal
→ Compliance with regulating bodies
→ Laws related to contracts and employment
→ Union dynamics and issues

Ethical
→ Necessary reporting procedures
→ Impacts of reputation on business success
→ Confidentiality

Demographic
→ Total population make-up
→ Ethnic diversity
→ Age group dynamics
→ Gender differences
→ Population shifts

A Quick STEEPLED Example

'Self-Service Checkouts' have been a feature of many supermarkets for several years. Some people like them and some don't and there are arguments about whether, on balance, they're a good or bad thing. Let's briefly try to consider all angles – but particularly from a data analytics perspective – through a STEEPLED analysis:

> **Social**: Less human interaction? Anxiety about data?
> **Technological**: Quicker? Efficient? Are the systems reliable?
> **Economic**: Profit. Fewer staff? Unemployment?
> **Environmental**: Power consumption? Carbon footprint? More or less travel?
> **Political**: Could they ever be made compulsory or illegal?
> **Legal**: Does it change the way your data is handled? New legislation needed?
> **Ethical**: Can people 'cheat' the system? Are there privacy concerns?
> **Demographic**: Favoured by/discriminating against different ages or groups? Restricted sales?

This is by no means an exhaustive list: you can probably think of others. And it makes for an interesting discussion. For example, whilst decreased human interaction is generally perceived as being bad, some individuals – those on the autistic spectrum, for example – might like them very much.