Digital Transformation – Evolution or Revolution?

Martin Wynn[a]*

[a]*School of Computing and Engineering, University of Gloucestershire, Cheltenham, UK.*

Email: MWynn@glos.ac.uk

The impact of digital technologies on industry and society at large is the subject of numerous recent studies - but how significant is "digital transformation" when put in historical context? Is it any more significant than that which followed the introduction of the personal computer in industry and society in the 1980s, or that instigated by the use of the Internet in the 1990s? The author looks back at his own experience in IT across this period to provide some possible answers.

The Mainframe Era

Late **1960s. Ford**'s centre for UK operations, Warley, Essex. **Data-processing department.**

Ford had two IBM 360-65 mainframe computers in its ground floor computer room. Each machine had 32 disc drives and 32 tape drives, plus card readers, card punches and several printers, and up to 1 megabyte of core memory. Production, inventory, payroll and sales data came in from the main UK manufacturing plants for processing.

In the tape library, trolley loads of tapes were set up for running different programming jobs, and taken to the computer room. They were later collected and put back in the stacked shelves of the tape library. Each tape had a cardboard record card, on which movements in and out of the tape library were noted down. The cards were then stored away in sliding metal drawers.

Upstairs in the Finance department, about 25 staff worked on analysing data. Equipped with lined graph paper, pencil, rubber and print outs from the computer room, they were

assigned tasks involving arithmetic calculations, some of them quite complex. These were then checked over by the senior analyst.

The Advent of the Personal Computer

Mid-**1980s. Glaxo** Pharmaceuticals, Greenford, London. **Information Management Division**.

Glaxo had Hewlett Packard HP3000 mini-computers, which were connected in radial fashion to about 1000 Visual Display Units (VDUs). From these "dumb terminals", users could access the company's main production, sales and finance systems (written in-house in Cobol, Pascal or Fortran).

In the mid to late 1980s, the IT provision changed dramatically, as the personal computer (PC) was introduced across the company's four main sites. These new desk-top machines could use the company's main information systems, but also had access to a range of new PC tools including spreadsheets, databases, graphics packages and word-processors (Figure 1). The download of data from the main information systems for use in spreadsheets and databases became possible. End-user computing had arrived.

The end of the 1980s witnessed further disruptive change as the first modules of a packaged business software product – SAP – were implemented. Some of the old in-house program suites were phased out, with major implications for future systems

development and support. On the PCs, Microsoft Windows emerged as the dominant operating system, bringing about major consolidation in the PC software sector.

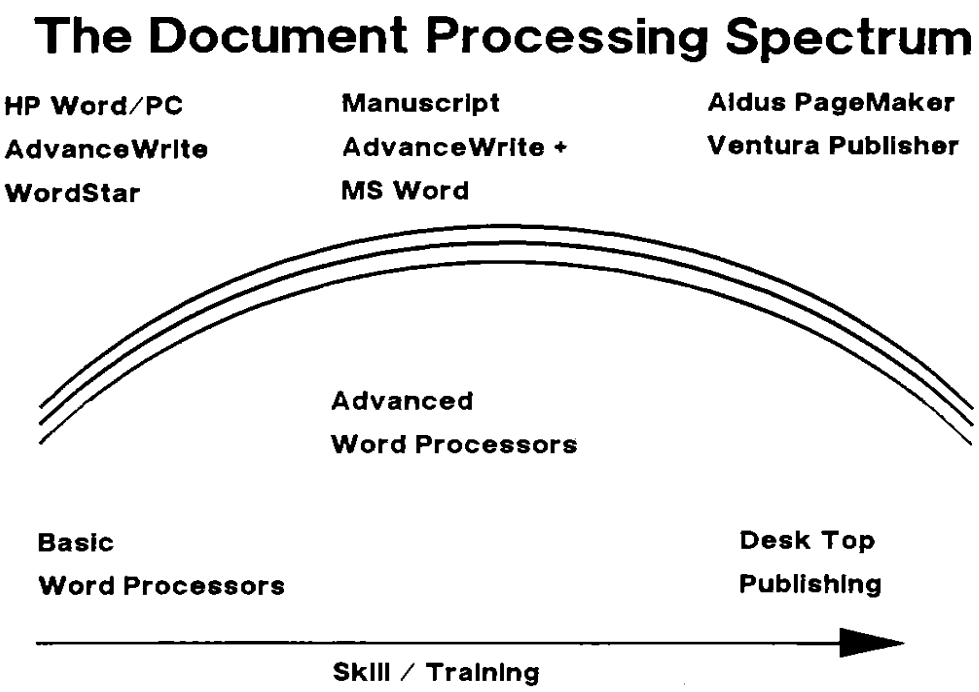

Figure 1. *PC based word-processor options in the mid-1980s at Glaxo Pharmaceuticals*

In the 1980s, Microsoft WORD was just one of many products available for the personal computer, but this package subsequently came to dominate the document-processing software market. Similar developments followed with spreadsheets, graphics and email packages.

The Internet "Changes Everything"

Year **2000.** Cider-maker **HP Bulmer**, Hereford, UK. **Information Technology Department.**

Bulmer had migrated from its old legacy systems running on proprietary hardware, to an integrated set of software packages. The majority of this software was Oracle based, and

ran on Intel chip-based servers. The Internet, laptop computers and mobile phones were widely used across the company.

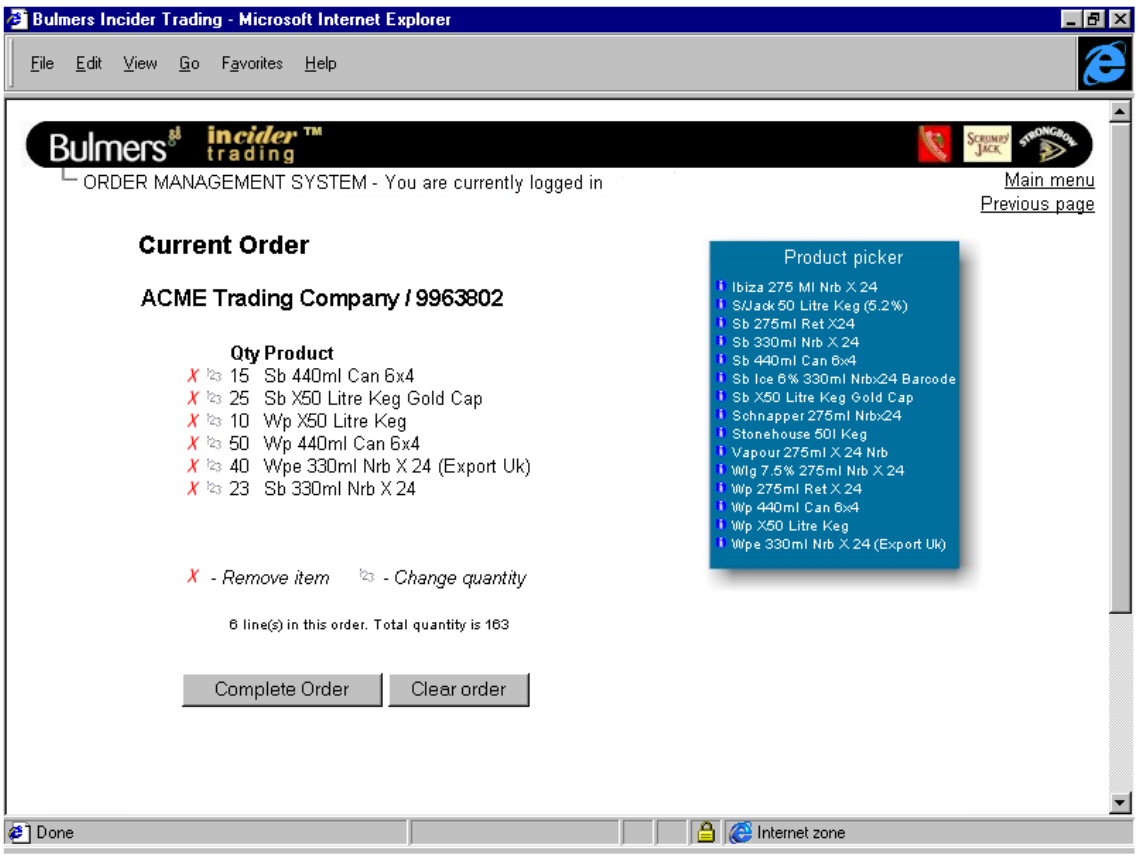

Figure 2. *The Bulmer Business-to-Business web-based order capture system 2000 (Incider trading).*

E-business capabilities were being rapidly developed by an in-house team, with Business-to-Business and Business-to-Consumer order capture systems available on the web (Figure 2). Ownership and management of elements of the IT provision had been transferred to the business functions, for process management, data and systems maintenance, and e-business operations. Some of the systems were hosted off-site by third-party providers.

Some of the key IT issues of the day were highlighted at the IT Directors Forum in year 2000 (Y2K). These included: the rapid growth of e-business, the growing significance of information and data management, the need for new skills and competencies in the IT team, and the growing importance of IT security, following the Y2K technology hiatus.

The University has a "best of breed" approach to its information systems, some of which are accessed via the Cloud and some of which remain on-premises. A full migration to the Cloud is planned in the next 3-5 years. Digital technologies are much in evidence across the university's four main campuses, notably social media, mobile, Internet of Things and analytics. Artificial intelligence and blockchain applications are being trialled and assessed. Wi-Fi connectivity has replaced much of the old hard-wired local area network infrastructure. The university has a digital strategy (as well as an IT strategy), which notes "the evolution of technology is having an impact on how teaching is be delivered and increasing the expectation of students. Education 4.0 will change the way teaching and learning is delivered making it more rewarding, and preparing students for this new dependence on systems, automation and intelligence in the workplace".

Digital Transformation: Evolution or Revolution?

These new ways of working are seen by some as a "remote work revolution", accelerated by the Covid-19 pandemic. Digitalisation has also been the catalyst for changes in the way IT is managed in some organisations. Business functions have taken on new responsibilities for managing digital technology projects, and IT strategy being repurposed accordingly.

The subjective snapshots outlined above provide only a very partial view of change over the recent past. Dentzel recently observed that "information technologies have wrought fundamental change throughout society, driving it forward from the industrial age to the networked era". Whilst digitalisation has certainly had a very significant impact on business and society, it has arguably not been any greater than that of new technology developments in previous eras. At Ford in the late sixties, each mainframe computer had just 1 megabyte of memory and business analysts used pencil and paper. Today, desk-top PCs typically have at least 8 gigabytes of memory, and we have at our disposal a remarkable range of communication and analytical tools. This has been the cumulative result of a series of evolutionary changes in technology and their application in business and society. Nevertheless, the continued development and widening deployment of digital technologies remains one of the key challenges facing all organisations today. Their impact on our daily lives will inevitably continue to gather further pace and momentum.

Reference:

Wynn, M.G. (2022). *Handbook of Research on Digital Transformation, industry use cases, and the impact of Disruptive Technologies*. (2022). Advances in E-Business Research. https://doi.org/10.4018/978-1-7998-7712-7. https://eprints.glos.ac.uk/10126/.

Martin Wynn is Associate Professor in Information Technology in the School of Computing and Engineering at the University of Gloucestershire. Having gained his PhD at Nottingham Trent University, he was appointed Research Fellow at East London University, and then spent 20 years in industry at Glaxo Pharmaceuticals and HP Bulmer Drinks, now part of Heineken UK, before returning to academia in 2002. His research interests include digitalisation, information systems, sustainability, project management and urban planning. His latest book, *Handbook of Research on Digital Transformation, Industry Use Cases, and the Impact of Disruptive Technologies,* was published in 2022. (https://www.igi-global.com/book/handbook-research-digital-transformation-industry/265448).

ORCID: https://orcid.org/my-orcid?orcid=0000-0001-7619-6079

LINKED IN: https://www.linkedin.com/in/martin-wynn-79296a2/?originalSubdomain=uk

SCOPUS: https://www.scopus.com/authid/detail.uri?authorId=7005117935

Martin Wynn