This paper reviews the indicators prepared for the 2008 edition of the Information Technology Outlook in preparation for the 2010 edition. It is designed to examine these indicators and discuss the extent to which they capture the current and near-term outlook for the ICT sector.

The paper is circulated for discussion and comments regarding indicators that Delegations find most useful for mapping near-term trends for the Information Technology Outlook, and suggestions for other indicators that could be examined.
INFORMATION TECHNOLOGY OUTLOOK 2010: INDICATORS FOR THE OUTLOOK

Introduction

1. The 2008 edition of the Information Technology Outlook uses a range of indicators to describe recent performance and to attempt to assess likely near-term trends. These are designed and chosen to provide the Information Technology Outlook with a plausible outlook for the ICT industry. This year’s outlook has been particularly difficult to prepare as the financial crisis has very rapidly worsened and spilled over into the real economy. OECD macroeconomic projections shifted down sharply in the 10 weeks from early September 2008 to mid-November 2008. Short and medium term projections in this period shifted from a rapid slowdown in growth and the onset of recession in some OECD countries (OECD, 2 September 2008), to the OECD area as a whole appearing to have entered recession and unemployment rising in many OECD countries, with the ongoing financial crisis the prime driver of the deep economic downturn (OECD, 13 November 2008 and 25 November 2008).

2. Against this background, the Information Technology Outlook 2008 has been particularly difficult to position. On the one hand, longer-term prospects and trends for the ICT sector remain good, with a continuation of the steady growth over the last 15 years (despite the fall in 2001-2002) across many segments. This growth is driven by product, process and organisational innovation and the ensuing increased share of ICTs in business and consumer expenditure. On the other hand ICT expenditures risk being volatile. On the investment side due to the “acceleration principle”, investment is approximately proportional to the rate of change of output. This magnifies changes in investment in both growth periods and slumps. On the consumer side, consumer confidence has been falling very rapidly with the bursting of the housing price bubble and rapidly declining stock market prices. The “wealth effect” (people feel less rich despite unchanged income) becomes a factor slowing consumer spending on ICTs, particularly when coupled with rising unemployment (potentially reducing consumption expenditure) and increasing worries about job security (increasing household savings ratios).

3. The next sections look at the indicators used in the IT Outlook to discuss their usefulness in identifying trends during very turbulent economic conditions.

Indicators used

Short-term ICT production indicators

4. The Outlook uses official monthly production, shipment or sales data in seasonally adjusted current terms, calculating 12-month moving averages. These data are presented in Figures 1-4 for the US, Germany, France and Japan. Figure 5 for Canada is based on quarterly real output. These data are available

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1 OECD (2008a), What is the economic outlook for OECD countries? An interim assessment, 2 September, OECD, Paris. In this assessment year-on-year growth for all of 2008 was projected to be: US 1.8%, Japan 1.2%, and the Euro area 1.3%. Ten weeks later (OECD, 2008b), due to the severity of the Q3/Q4 downturn, these projections were revised sharply down to year-on-year growth for 2008 to be: US 1.4%, Japan 0.5% and the Euro area 1.1%, with the November Q4 forecasts mostly on the down-side of the outer lower bounds forecast in September, such is the severity of the 2008 Q3/Q4 downturn. The continuing bad news also suggests that 2008 Q4, and 2009 Q1 and Q2 will be further revised downwards.

with a lag of around 6-10 weeks. A mixture of goods and services are presented, with the criteria for selection being timeliness and representivity, i.e. the indicators are of domestic market behavior to a considerable extent, despite ICTs being highly tradable. They also look at developments in IT services as well as ICT goods. Because the data are smoothed by using 12 month moving averages, they will tend to be lagging indicators rather than leading ones.

5. Overall these indicators show the following features:
   • They are around 2 months behind the current period, so they have not yet captured the performance of the ICT sector during the current very sharp economic decline and recession in the real economy;
   • So far they have not shown the massive declines in output seen in the last downturn around 2002. Using 12 month moving averages smooths fluctuations and masks sudden changes in direction of output; 3 month moving averages do not change the overall interpretation of data, but show more clearly the recent decline to negative growth in the US and slow-down in Germany and Japan; monthly data are very “noisy” and should not be over-interpreted;
   • Semiconductors / components generally lead the cyclical evolution, going into negative growth (recession) first and pulling out into positive growth first;
   • ICT services have grown more steadily and still retain clearly positive growth in the most recent data, but with a slow-down or September decline in all countries for which data are available;
   • ICT services are growing considerably faster than total services and much faster than ICT goods.

6. The slow-down / down-turn has not yet clearly appeared in the short-term indicators of ICT production, but both goods and services production have obviously slowed rapidly. This can be interpreted in two ways, either:
   i) Most of the indicators are lagging rather than leading indicators with the exception of semiconductors. They have still to catch up with the reality of the OECD recession (compare the magnitude of the steep downturn in production / sales around the end of 2002, with the current flattening of growth, although 12-month moving averages mask very recent drops in production); or alternatively
   ii) The ICT sector is not going to experience the same depth of downturn as seen during the last collapse over the 2001-2003 period, and will continue to perform relatively well compared both with that period and with current GDP performance.

7. It is still too soon to tell which is happening based on the most recent monthly short-term indicators.

**Semiconductor sales and markets**

8. The Outlook uses semiconductor production and markets as the most up-to-date indicator of cyclical behavior, based on its utility as a leading indicator of ICT goods and production. Because of its role as an intermediate input into ICT goods production, semiconductor production and sales data are good leading indicators of likely trends in production of other ICT goods, as shown in the monthly data above. Global data on semiconductor markets are available from private sources (the Semiconductor Industry Association, SIA), and monthly market developments are published with about 1½ month delay.

9. From the SIA data the outlook for the current year is available regularly. Projections for the coming year are available in November. Projections of global semiconductor markets for all of 2008 were revised up to around 5% in the earlier part of the year after a somewhat slow start to 2008. These data have
been progressively revised downwards with the rapid slowdown from September 2008 and global market growth is now expected to be around 2% for 2008 and projected to be around -6% in 2009 (see Figure 6). Better measures of likely future trends are:

i) Trends in capacity utilization for the production of various kinds of semiconductor wafers before processing into semiconductor components. Detailed data are available every 3 months from the SIA. They have shown high capacity utilisation in recent periods (above 90%) for the most advanced semiconductors, but dropping in the most recent period (below 90%), and peak capacity utilisation in 2008 was not as high as the previous peak in 2006 and capacity utilisation was slowing in mid-2008.

ii) Book to bill ratios are another forward indicator of future sales trends of semiconductors. “Bookings” are new orders, “billings” are actual sales. Values over 1 mean that production will grow, values below 1 mean it will fall. Data are from private sources. This indicators have been <1 over the last few months.

iii) Sales / orders of semiconductor manufacturing equipment are probably the most forward looking indicator. They capture the forward perceptions of semiconductor producers some 6-12 months in advance. These data come from a variety of private sources (Fabtech, Semiconductor International, Manufacturing.net, etc.). These all show that semiconductor manufacturing equipment sales have dropped 20-40%, showing the usual accelerator / decelerator effect, and suggesting that the semiconductor industry is in for a tough time according to manufacturers’ perceptions.

10. Overall, semiconductor production-related performance indicators have been the indicators of choice looking forward.

Venture capital

11. Venture capital gives a view of future potential as viewed by risk-taking investors. However the volume of these funds is constrained by the availability of finance and potential for successful exit strategies. These data are mainly collected and published with a lag by VC industry associations, and are not yet readily comparable across countries. Detailed quarterly US data is available with a lag of around 1 month and as the US is by far the largest VC market, these data are indicative of global trends in terms of the potential of ICT innovations.

12. The most recent data (Q3, 2008) show that ICT VC has held up moderately well, but that it declined somewhat in Q3, both in current USD terms and as share of all VC (see Figure 7). Overall the VC data indicate the continuing importance of ICTs in venture capital investments despite the financial market crash starting in Q3 2008.

Quarterly results for large ICT firms

13. Quarterly results for large ICT firms are available with a few weeks lag in most cases. These give a good overview of the recent evolution of ICT firms and the sector. The last review for Q3 2008 prepared for the IT Outlook publication showed very heterogeneous results, and it is evident that geographical and firm-specific factors also count for a large deal of their variability. In Q3 2008, IT services and software firms were continuing to perform well as did Internet firms in general. Other sectors were mixed with stress or declines in many. However, it could be useful to investigate available quarterly composite or segment-specific results indicators which usefully capture short-term production and sales trends.
Longer-term trends: The ICT sector, ICT-related employment and ICT trade

14. **The ICT sector: Value added and employment.** Indicators of ICT sector value added and employment are compiled annually, based on data from the OECD Structural Analysis Data Base (STAN), official statistics and partial estimations (see Figures 8a and 8b). These data are national accounts-compatible and timeliness is constrained by the relatively long delay in preparing detailed national accounts sector data. Overall these data provide an in-depth view of longer-term trends and developments. However they do not help preparing recent or outlook indicators, and they probably cannot easily be prepared with a shorter time lag, i.e. less than 2 years.

15. Overall, these indicators show the continuing long-term relative growth in ICT sector value added and flattening off of ICT sector employment measured as shares of business value added and employment respectively.

16. **ICT-related employment.** These indicators are constructed to show ICT-related employment (ICT specialists such as software engineers, and ICT-intensive users such as scientists or office workers) over time and across countries, although cross-country comparisons cannot be over-interpreted (see Figures 9a and 9b). The underlying data are taken either from quarterly labour force surveys or annual labour force surveys and have a lag of around 6 months. This could be reduced somewhat for some countries, but for the total sample of countries for which appropriate data are available, they cannot be provided much more rapidly. These data are calculated as shares of total employment, so in the current OECD area recession they may increase their share and perform better than total employment. ICT skilled unemployment could also be explored.

17. Overall these indicators show the continuing growth of ICT specialists as a share of the total labour force, but a flattening of the share of ICT-intensive users.

18. **ICT trade.** The annual trade data have a lag of around nine months before all OECD countries have reported. The full data set can only be prepared when the slowest countries have reported. Furthermore, there are problems in constructing the correspondence table between the “old” HS1996 and HS2002 classifications and the “new” HS2007 classification and simple walkovers between the two systems. More recent detailed quarterly data can be drawn from national sources to provide broad trends but these are often not comparable.

19. Overall trade data have shown continued growth in global ICT trade, but the change in classification in 2007 makes interpretation of detailed trends and changes in trade for 2007 difficult.

Questions for discussion

- What are the most relevant short-term indicators of ICT sector performance, taking into account the difficulties seen in catching up with the trend downturn and the start of recession in 2008?
- What indicators can be used to improve the outlook component of this work?
- What areas of long-term trends are of most interest? Should more work on ICT employment and skills be undertaken in view of the current recession and rising unemployment?
- Would it be useful to have an update of selected short-term trends and long-term data on a regular basis between Outlooks?
Figure 1. Growth in monthly shipments of ICT goods by segment in the United States, December 2001 - September 2008

Source: OECD, based on US Bureau of the Census, Manufacturer’s Shipments, Inventories and Orders (M3) survey, November 2008. www.census.gov/indicator/www/m3/.

Figure 2. Growth in monthly production in selected ICT sectors in Germany, December 2001 - September 2008

Figure 3. Growth in monthly turnover in selected ICT sectors in France, December 2001 - August 2008

Source: INSEE, Indice et séries statistiques, November 2008.

Figure 4. Growth of monthly sales of IT services industries in Japan, December 2001- September 2008

Figure 5. Trends in real output (GDP) in the Canadian ICT sector, Q1 2002-Q2 2008


Figure 6. Worldwide semiconductor market by region, 1990-2009
USD billions, current prices

Note: 2008 data are preliminary and 2009 forecast.
Source: OECD, partly estimated based on World Semiconductor Trade Statistics (WSTS).
Figure 7. Quarterly venture capital investments in the ICT sector in the United States, Q1 1995-Q3 2008
In billion USD and percentages

Note: The ICT sector comprises the following: software, media and entertainment, IT services, telecommunications, semiconductors, computers and peripherals, networking equipment, electronics and instrumentation.

Figure 8a. Share of ICT value added in business sector value added, 1995 and 2006

3. ICT wholesale (5150) is not available.
4. Telecommunication services (642) included Postal services.
5. Rental of ICT goods (7123) is not available.
Source: OECD estimates, based on national sources; STAN and National Accounts databases, April 2008.
Figure 8b. Share of ICT employment in business sector employment, 1995 and 2006

1. 2005 instead of 2006
3. Based on employees figures
4. ICT wholesale (5150) is not available.
5. Telecommunication services (642) included Postal services.
6. Rental of ICT goods (7123) is not available.

Source: OECD estimates, based on national sources; STAN and National Accounts databases, April 2008.

Figure 9a. Share of ICT-related occupations in the total economy, specialist users \(^{1}\), 1995 \(^{2}\) and 2007

1. Narrow definition based on methodology described in OECD (2004, IT Outlook, Chapter 6). The shares for non-European countries are not directly comparable with shares for European countries as the classifications were not harmonized. The EU15 aggregate has been estimated for missing years.

Figure 9b. Share of ICT-related occupations in the total economy, intensive users (1), 1995 (2) and 2007

1. Broad definition based on methodology described in OECD (2004, IT Outlook, Chapter 6). The shares for non-European countries are not directly comparable with shares for European countries as the classifications are not harmonized. The EU15 aggregate has been estimated for missing years.


Figure 10. World trade in ICT goods, 1996-2007
USD billions, current prices


Source: OECD-UNSD ITCS and the UN COMTRADE database, November 2008.