# Supervisions and Tablets
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This is a summary of how I use tablets within supervisions together with my thoughts about the advantages, disadvantages and open questions about developing their use for teaching engineering.

## Context

I supervise Engineering Part IB Papers 5-7 for Queens' College. The supervision system at Queens' means that I teach the same students all year for half their course. The high level of continuity with student groups provided motivation to look for ways to make supervisions more engaging and more efficient.

## Overall Setup

I have used a variety of setups over the years, but the common features are: a pen input device; wireless keyboard and mouse; a pc/mac running a full operating system; Microsoft OneNote; a shared folder system for resources, notes and progress tracking; and a monitor on the desk that all can see.
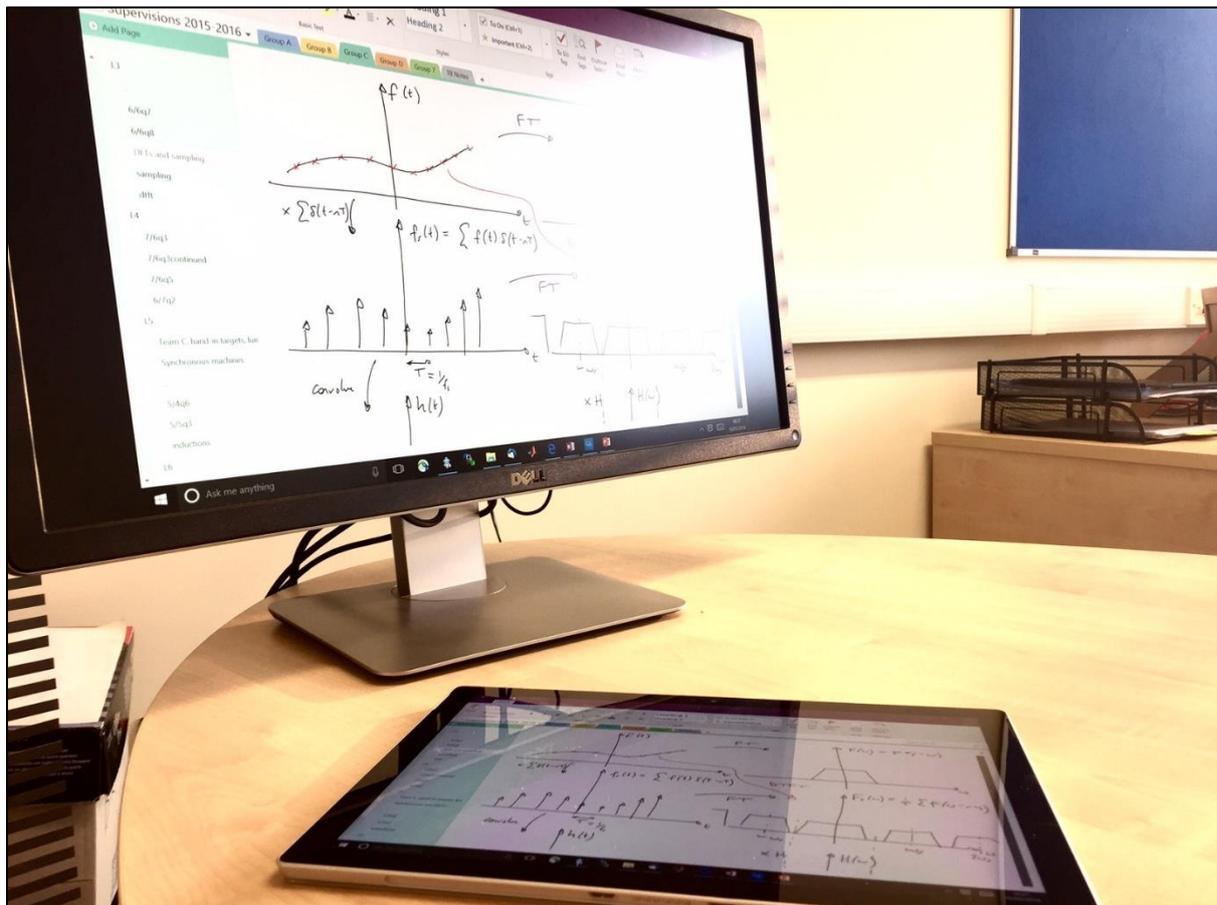


## Benefits

I think the main advantages of using tablets in supervisions are:

- Everyone can see what you're writing, it's the right way up and anyone can reach the screen to point at relevant things: it solves the problem of two or three students crowding around a sheet of A4 reading upside down writing, or trying to point at something on a distant whiteboard;
- The notes produced for students are 'cleaner', because small errors and slips made during a live supervision are easy to tidy up or delete;
- The tablet can be passed around for anyone to contribute to or attempt questions;
- External content is easy to import, such as Tripos Questions or graphs that can be drawn on directly;
- By having a computer that is already on and running, Matlab (or Python or C++) is instantly available. This allows demos to be made live, demos to be prepared in advance, and computing questions within examples papers to be explored. It also allows students to share their own computing solutions using the shared folders;
- The technology itself can be useful material for teaching: wireless communication, touchscreen surface materials, electronics, etc.;
- Notes can be shared as PDFs to all students, saving paper and avoiding the problem of asking a volunteer to photocopy them;
- Notes are searchable (with a bit of thought to tag content appropriately – I label every page with the examples sheet and question or Tripos paper and question);
- Allows easier progress tracking (see later).
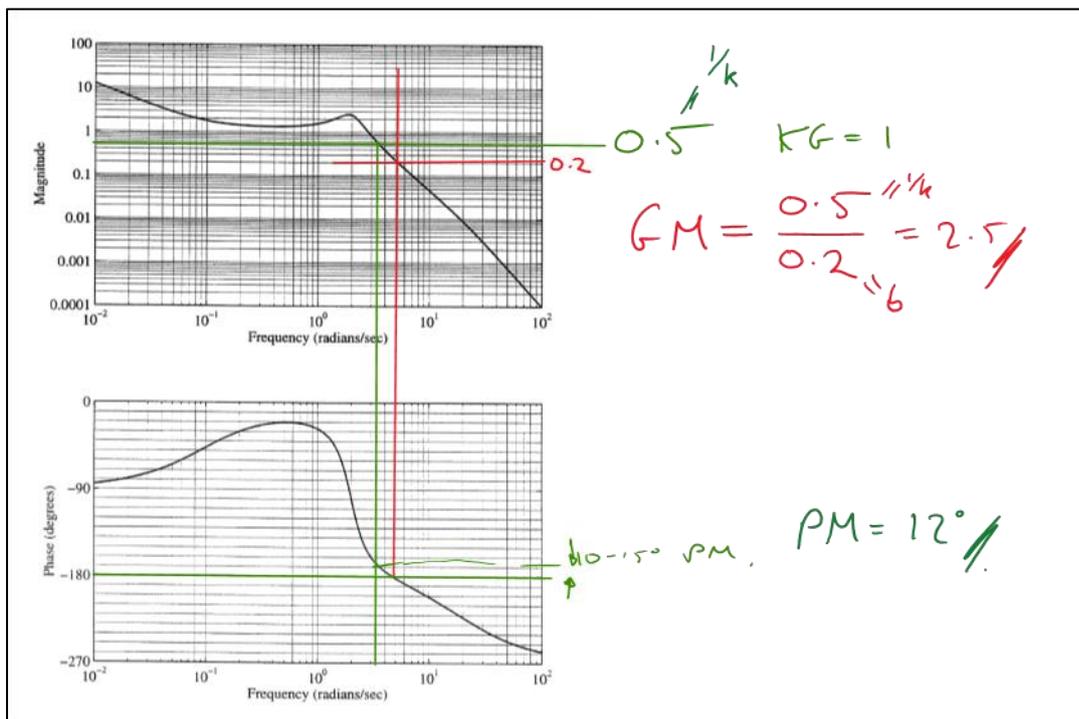


There are a few disadvantages:

- It doesn't always work: computers crash, drivers fail, wireless devices run out of battery and sometimes disconnect themselves for no reason. I always have pen and paper as a backup together with a phone app for scanning the notes to PDF afterwards, e.g. CamScanner;
- There is a bit of setup time each week: turning on the monitor, connecting devices, logging in to shared folders all take a bit of time that needs to be factored in;
- Writing on screen takes a bit of getting used to;

- Sometimes the technology can be a distraction to the actual supervision content, but usually this is not a problem.

I find that the advantages completely outweigh the disadvantages in the context of supervisions. Within lectures the balance shifts: for example, reliability becomes a much higher priority.

## Shared Resources and Progress Tracking

I use Google Drive for file sharing and progress tracking. The system I use is as follows:

- A shared Google Drive folder with read-write access for each supervision group;
  - This is where exported PDFs of supervision notes are shared;
  - Students can upload any code solutions to this folder
  - This contains a Google Sheet for tracking progress, loosely based on the sheets supplied by the engineering Teaching Office.
- A shared Google Drive folder with read-only access for the whole cohort of students;
  - This is where Matlab demo scripts are saved for students to copy and play with outside of supervisions;
  - Any additional material of interest to the whole cohort is placed here, e.g. topic summary sheets that I have made to address common issues;

Google Drive has the advantage of having an easy interface, with ability to have multiple users edit sheets without file version conflicts etc. Many other models exist: I have used Camtools in past; Moodle may have potential; or the department owncloud server could work well.

Progress tracking spreadsheets are well-received by students. I try to use them to create team spirit within supervisions, as a tool to help them organise themselves individually and as supervision groups, and to help identify common questions. In addition, the sheets help CAMCORS reporting and help identify struggling students more quickly.

## Hardware and Software

I have used the following setups:

- HP Touchsmart hybrid laptop running Windows 7 (2009-2012): good for writing on screen but laptop performance not particularly good and did not last very long;
- Wacom Intuos 4 with a Macbook Pro (2012-2015): good for separating input device from laptop, so avoiding the need to maintain multiple computers, but takes a lot more practise to get used to not writing directly on screen. This also prevents students from easily contributing their own working to the notes during a supervision. Also at the time, OneNote for OSX did not allow ink input so I ran virtual Windows using Parallels and connected the Wacom input device to Windows. In addition the wireless dongle for the Intuos 4 did not work well;
- Surface Pro 4 running Windows 10 with Microsoft wireless display adapter (2015-present). This has provided the best experience so far, with no cables on the desk. Nevertheless software problems sometimes interrupt supervisions;
- OneNote: the best ink-input note taking software I have found to date;
- Camtools for sharing documents: not the easiest to use system for controlling permissions;
- Google Drive: allows easy control of sharing permissions, and sharable spreadsheets for progress tracking;
- Matlab: allows demos to be written live within a supervision to help explain topics.

Part IB Record Sheet - Group A

Formula bar: `=J5+1`

| Paper | no. | 1-15 (progress) | Notes | M count | L count | M total | L total |
|---|---|---|---|---|---|---|---|
| | | | | 10 Mar 2016 | | | |

| TERM | Start | End | Fraction through term |
|---|---|---|---|
| Michaelmas | 08/10/2015 | 03/12/2015 | 1.00 |
| Lent | 14/01/2016 | 10/03/2016 | 1.00 |

STATS

| Paper | no. | M count | L count | M total | L total |
|---|---|---|---|---|---|
| 5 | 1 | 7 | | 7 | |
| | 2 | 10 | | 10 | |
| | 3 | | 6 | | 6 |
| | 4 | | 8 | | 8 |
| 5 | 5 | | 4 | | 4 |
| | 6 | | 9 | | 9 |
| | 7 | | 5 | | 9 |
| | 1 | 11 | | 11 | |
| 6 | 2 | 9 | | 9 | |
| | 3 | 5 | | 5 | |
| | 4 | 7 | | 7 | |
| | 5 | | 9 | | 9 |
| | 6 | | 10 | | 10 |
| 6 | 7 | | 7 | | 7 |
| | 8 | | 9 | | 9 |
| | 9 | | 2 | | 6 |
| | 1 | 12 | | 12 | |
| 7 | 2 | 10 | | 10 | |
| | 3 | 11 | | 11 | |
| | 4 | 12 | | 12 | |
| | 5 | | 10 | | 10 |
| 7 | 6 | | 7 | | 7 |
| | 7 | | 13 | | 13 |
| | 8 | | 9 | | 9 |

| | T | U | V | W |
|---|---|---|---|---|
| TOTAL DONE = | 94 | 108 | 94 | 116 |
| RUNNING TARGET = | 94 | 116 | | |
| ESTIMATED LEFT BY VAC = | 0 | 8 | | |
| ESTIMATED PAPERS LEFT BY VAC = | 0.00 | 0.97 | | |

| Paper 5 | 49 | / | 53 |
|---|---|---|---|
| Paper 6 | 69 | / | 73 |
| Paper 7 | 84 | / | 84 |

# Final thoughts

I have found teaching with tablets makes supervisions more efficient, provides new ways to engage students by having computing resources (e.g. Matlab) readily available, and simplifies record-keeping.