6 common mistakes and how to avoid them … *a view from 30 years of designing for wireless connectivity*

Wireless? …that's easy, modules and antennas are widely available.

Yes they are, the market is served by a vast number of excellent standard products. BUT, the temptation to see the wireless channel as a conduit for your data that resembles a wired connection may land you in deep trouble. The radio interference environment is highly variable as can be the range and reliability performance of your wireless connected product. Field testing alone isn't likely to be enough to ensure your product will not be adversely affected by the radio 'neighbours' in some user locations, at some times of the day.

AVOID embarking on a wireless connected product development and making choices without expert and independent wireless engineering input from the concept stage, before band and hardware choices are made.

Wrong frequency band selection.

Sometimes frequency bands are selected that will not be capable of meeting your product target specification in real world user environments. The full realisation and the disappointment often only materialises quite sometime after product introduction. Several years of uncompetitive product marketing may result. A common example of this are attempts to use WiFi to cover whole dwellings or commercial premises, sometimes with repeaters. Bluetooth range is similarly oversold on occasion.

AVOID selecting the band and wireless technology without internal RF expertise or consultation with an independent wireless expert. In the first instance, this probably isn't a module vendor!

Wrong choice of hardware spec, incompatibility with the neighbours!

As previously mentioned, the interference environment is critical. Your wireless hardware performance needs careful selection to ensure your product target specification is enjoyed by all your customers.

AVOID selecting hardware without a thorough understanding of your wireless 'neighbours' and how your product will co-exist. Silicon vendor marketing departments are often guilty of vastly over simplifying this area.

Wireless engineering expertise placed too late in the project plan.

This is very much like the old chestnut of EMC regulatory compliance. EMC preliminary testing is left too late and remedial solutions are consequently limited leading to added BOM cost and/or reduced features. Wireless integration often suffers the same fate, particularly in companies that have not felt the pain from prior development experiences.

AVOID thinking of the wireless channel as a simple conduit. Module and antenna vendors are naturally predisposed to make the integration of wireless with your new product development appear a paper exercise. That simply isn't the case and acceptable performance needs more planning. Optimum performance needs much more planning. Involve an internal or external expert at the earliest opportunity, working alongside your mechanical and electronic product development engineers.

Inadequate planning and space for the antenna.

This can have a huge effect on your product performance. Whilst most of the required RF hardware engineering is offered up by standard modules, the art and craft of embedded antenna design and integration should not be attempted by a novice. Again, there are lots of folks out there with a vested interest in making you think this may be a viable option, it isn't. Test equipment and a motivated desire to learn are not enough, unless you have the time to wait, a lot of time!

AVOID underestimating the critical role of competent antenna design in the success of your wireless connected product.

Do it yourself wireless, the chip approach, no RF engineer required?

If your product volumes permit, a custom radio, rather than an off the shelf module, may be considered. Not involving an experienced RF engineer in the application of the radio silicon is very likely to be costly in the long run.

AVOID underestimating the subtle and unique issues in laying out a successful radio PCB and getting into the radio manufacturing business!