Smaller, Cheaper, "Better" – Disruptive Innovation for Chemical Detection. An Essay

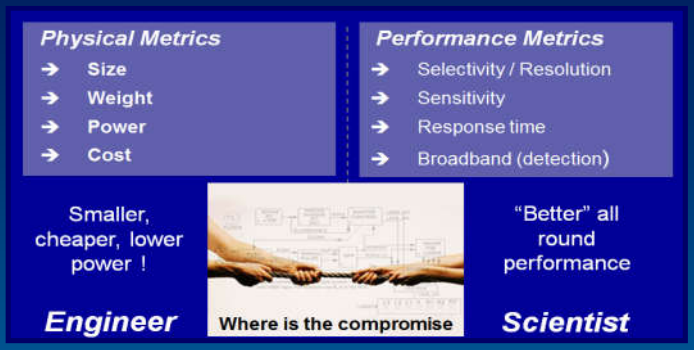
Ashley Wilks, BDM (Technology) & Mark Brennan, EVP Homeland Defense
Owlstone Inc., 761 Main Avenue Norwalk, CT 06851

Abstract

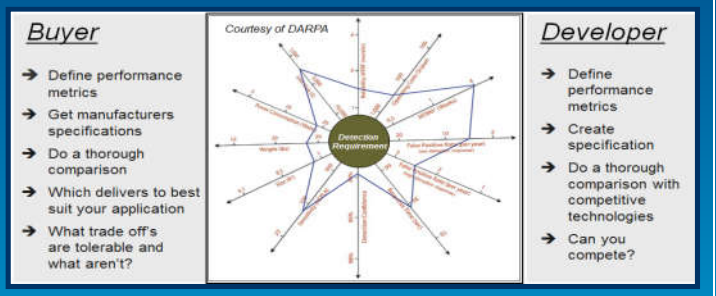
A *Disruptive Innovation* is defined as an innovation that creates a new market and value network, and eventually goes on to disrupt an existing market and value network, displacing an earlier technology. A well-known example of a disruptive innovation is flash-memory, an innovation which has transformed the electronics consumer markets through the availability of cheap, robust and very-high-density data storage. There can be little denial that the Chemical Detection (CD) market is in need of a disruptive technology to deliver the capability demanded by users. There is a significant gap between what exists off-the-shelf and what the war-fighter, first responder and/or security professional would really like. The result has been a proliferation of system solutions of varying specifications and CONOPS based (essentially) on a set of core, long established, technologies (MS, IR, IMS, *etc.*). Performance *verses* cost compromises are often severe. Not surprisingly the, organizations such as DARPA and HSARPA invest at the grass roots, with the mission to deliver disruptive innovation in the CD space. So why are disruptive innovations in the CD space so elusive? To answer that question one must consider a utopic solution that would define an innovation as "disruptive". "Smaller, Cheaper, Better" might well be defined as the metrics by which the "disruptiveness" of the innovation is measured. The metrics "Smaller" and "Cheaper" speak for themselves – ubiquity, *i.e.*, presence of numbers, transforms CONOPs, expands capability, eliminates human factors, *etc*. "Better" is a crude metric. What defines "better" and when does better constitute "disruptive"?

Threat & Impact scale	V. High impact / low threat	High impact / medium threat	Medium impact / medium threat	Low impact / medium threat
Class	Chemical Warfare Agents (CWAs)	Toxic Industrial Chemicals (Class A)	Toxic Industrial Chemicals (Class B)	Toxic Industrial Chemicals (Class C)
Examples	Nerve, NTA's, Blister	Hydrogen Cyanide, Chlorine, Acidic gases , Phosgene	High toxicity organic solvents	Various toxic chemicals used in manufacturing
Agents in Group	~20?	> 20	> 40	> 40

Threat list of Today – *the challenge & it's proliferating; is a utopic solution possible?*



Engineering the System for the Job – it can be a frantic "tug-of war"; are you really communicating critical requirements and forward think?



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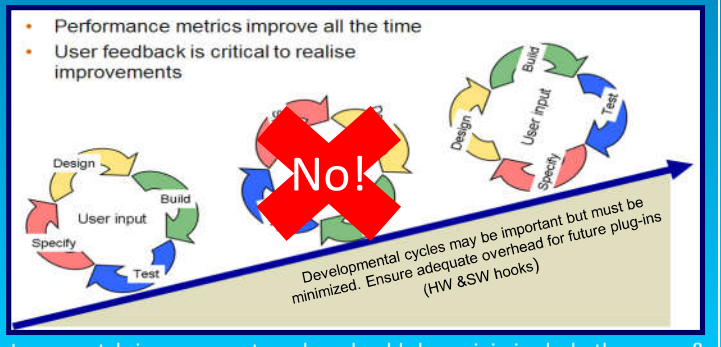
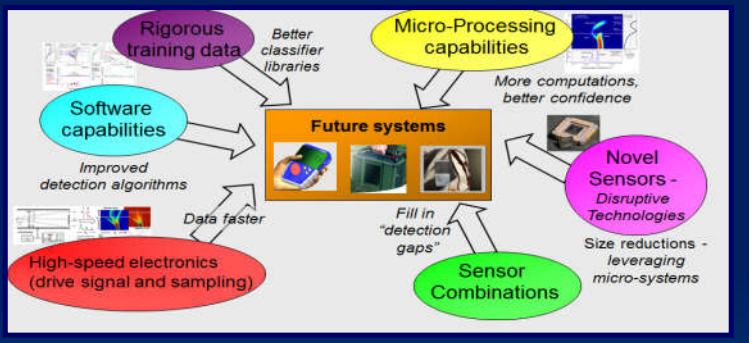
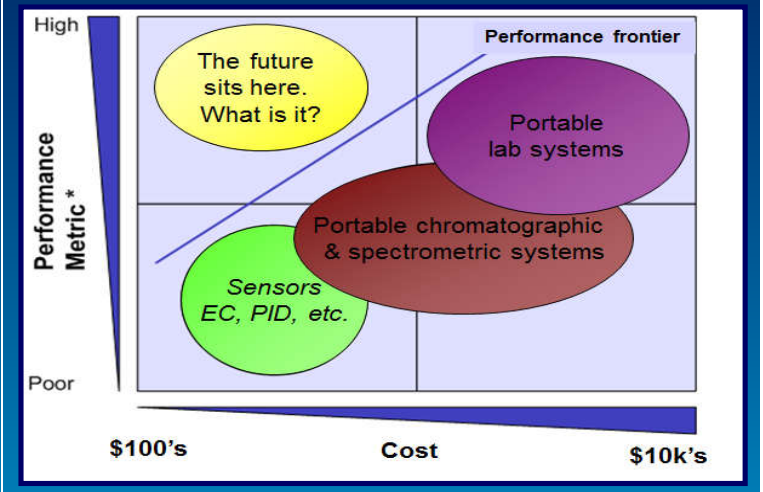


Incremental improvement cycles should be minimized; both users & developers for ensuring this. It is not one sided



Future system solutions will be data intensive – the "library" approach can be off-putting – the reality is that any "new" technology can only be as good as the data



Performance metrics include; Size, Selectivity, Sensitivity, Power Consumption, and Response Time

New market opportunities are the vendor drivers. Are they real? That is an important question

References
DARPA Chemical and Biological sensors study http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA458370