

# Smart business

*Helmut Baumgarten and Christian Bogatu consider how the introduction of smart containers may impact the business performance of logistics players*

Dr Christian Bogatu is a researcher on innovative security technology at the logistics department of the Berlin University of Technology. Advised by Professor Helmut Baumgarten, he is writing his Ph.D. thesis on 'the impact on business performance of logistics players from the introduction of smart containers'.

Working for McKinsey&Company for five years, Dr Bogatu provided consultancy services to large corporations across multiple continents, focusing mainly on high-tech and security technology. Prior to joining McKinsey, he co-founded and worked in several start-ups in Europe and USA.

Professor Baumgarten is the founder of the Department of Logistics at the Berlin University of Technology, and a pioneer in the development of advanced logistics methods and material flow. He has led more than 50 research and development projects and has written over 400 published research documents.

As an entrepreneur, Professor Baumgarten is the founder and owner of several international companies including Logplan, an airport planning and design consulting firm

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In the modern era of the 'globalised' economy, efficient, effective and secure logistics are a necessity – but current cargo security is just not tight enough. World-wide, more than 400 million twenty-foot equivalent units (TEUs) are handled in ports annually, a figure that increases by around 10% annually.

The ever-growing container industry has thereby traditionally been facing two major challenges:

- shipment and cargo integrity: goods worth \$10-\$50 billion a year are lost in high-value cargo theft in the US alone. As a result, insurance premiums are unnecessary high
- operating efficiency and effectiveness: use of people and equipment is still inefficient due to lack of visibility within the supply chain. This also leads to a loss of confidence among customers.

At the same time, globalisation also has an effect on the logistical value chain itself. Our complex global logistical networks face a growing threat from terrorists who know that they are vulnerable – and that a successful major attack could cost the world economy as much as \$1 trillion.

This leads to a newly-emerged third major challenge of the container industry:

- terrorist threat: each logistics company needs to determine how to

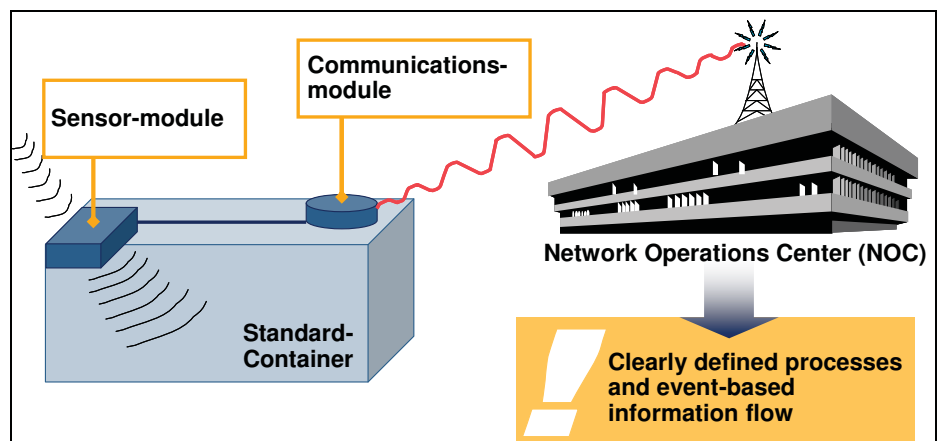
appropriately address this issue from a business perspective. Too much effort increases costs, while not enough effort may result in delays at Customs controls.

Smart containers can provide a solution: they not only increase the security, but also deliver measurable monetary business benefits to companies involved in the logistical value chain.

Smart containers can be described as a holistic solution that includes technology and processes that enhance the security and the efficiency and effectiveness of the transport of containers. The underlying technology consists of a sensor and a communications module (see Figure 1). The sensor unit includes a variety of sensors, memory, and the necessary processing power. The sensors can range from those which provide information on location, such as Global Positioning System (GPS) units, through devices that detect intrusion and monitor the condition of the cargo, up to 'threat detection' systems that can, for example, flag up the presence of radioactive material. The communication unit may enable readings on a short-range (e.g. radio frequency identification (RFID) or Zigbee) or on a regional (e.g. cellular technology) or global (satellite) scale.

The readings collected from each smart container are communicated to a network operations centre. There, clearly defined processes are triggered based

Figure 1: Simplified model of Smart Container and corresponding Network Operations Center



on the information that arrives. These processes may include the redistribution of containers in case of shortages in the supply chain or sending alarms to law enforcement agencies in the event of detected illegal or even terrorist activities.

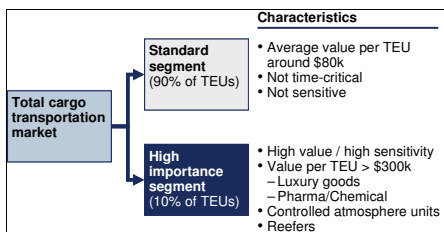
**Core beliefs on smart containers**

Smart containers are regarded as a hot topic by the logistics industry. At the same time, there is considerable uncertainty over the dominant technologies and applications in the future. Based on more than 100 interviews with industry experts worldwide, we have identified three core beliefs:

- the market splits into ‘high importance’ and ‘standard’ segments
- two types of smart containers emerge
- there is a strong business case for real-time systems in high importance segment.

The standard segment accounts for about 90% of the overall container market and includes containers that are neither considered to be especially valuable, nor time-critical, nor sensitive in any other form. Standard containers have an average value of about \$80,000 or less.

Figure 2: Logistics market splits into two segments



High importance containers represent about 10% of all shipped containers. They are typically of high value (above \$300,000 per container), time-critical, and/or highly sensitive. Luxury goods or pharmaceutical products are good examples of high importance goods. Controlled atmosphere units and refrigerated containers (reefers) are also generally seen as part of the high importance segment.

The two market segments are served

	Drivers	Core market	Issues / advantages
<b>Active RFID + Door sensor</b> <b>"Standard"</b>	<ul style="list-style-type: none"> <li>• Anti-Terror Regulations</li> <li>• Secondary: Higher efficiency</li> </ul>	<ul style="list-style-type: none"> <li>• All containers</li> <li>– Standard and high importance</li> </ul>	<ul style="list-style-type: none"> <li>– Very low acceptance in logistics industry</li> <li>– Expensive infrastructure necessary</li> <li>+ Joint venture of 4 big international players to push regulations</li> </ul>
vs.			
<b>GPS/GPRS/satellite + sensor suite</b> <b>"Real-time"</b>	<ul style="list-style-type: none"> <li>• Higher efficiency and theft protection</li> <li>• Secondary: Anti-Terror Regulations</li> </ul>	<ul style="list-style-type: none"> <li>• Only high importance segment</li> <li>– High value</li> <li>– High sensitivity</li> </ul>	<ul style="list-style-type: none"> <li>– Still perceived as too expensive (especially "reverse logistics")</li> <li>+ Infrastructure existing</li> <li>+ General acceptance in logistics industry for high importance segment</li> </ul>

Figure 3: Two differing technology schools of thought serve the two segments

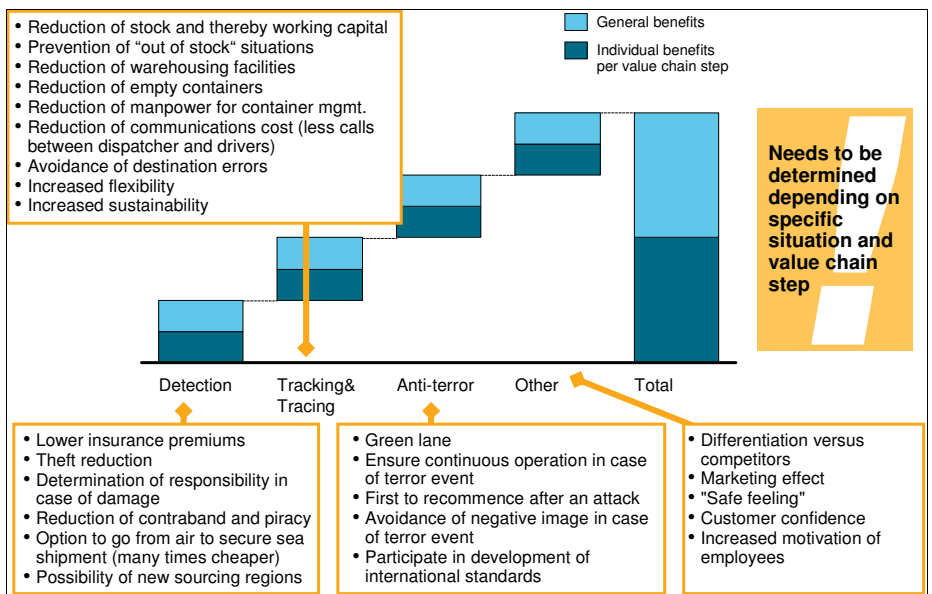


Figure 4: Benefits of Smart Container implementation

by two differing technology schools of thought in the smart container industry. The two fundamentally different approaches that are being developed are ‘standard’ and ‘real-time’ systems (see Figure 3).

Standard systems are much simpler as they use only RFID technology for communication. RFID only offers visibility at the moment the container

passes a pre-installed checkpoint. Sensors are mainly reduced to a simple door sensor.

Real-time systems, on the other hand, integrate cellular and/or satellite communications that offer the possibility of real-time tracking at any point in time and at any location in the world, provided that the network can be accessed. Also,

the sensor suite integrates any kind of sensor that the customer demands. In general, standard systems are still suffering from low acceptance in the logistics industry. The main problem is that it is necessary to equip every container with such a system in order to see benefits from anti-terrorism security and also increased efficiency. Furthermore, while each standard system in the container will be less costly than a real-time system, RFID still requires that new infrastructure is built at ports and at each important hub in the global logistical value chain. Real-time systems, on the other hand, build on existing infrastructure, such as mobile networks and GPS. When used with high importance containers, most experts agree that these systems make a lot of sense and there are good reasons why real-time systems could be implemented much faster on a broad scale.

With regard to the business case for using real-time systems in the high importance segment, potential benefits can come from the detection, tracking and tracing, and anti-terror capabilities of smart containers. Furthermore, a fourth source of benefits is the marketing and brand-building that companies can achieve from a secure supply chain (see Figure 4).

However, these potential benefits all sound quite theoretical: it is not clear how a company can actually see an impact on in its bottom line. We therefore analysed a Europe-to-Asia trade lane of a major consumer goods company to see how real-time smart containers could benefit a company's business performance.

The technology used in all of the 300 sea containers per year on that specific trade lane consisted of GPS-based tracking and tracing, intrusion sensors (for door, light and movement) and General Packet Radio Service (GPRS)-based communication. The cargo transported clearly justified the 'high importance' tag, with an average value per container of €400,000 (\$635,000). The expected benefits and

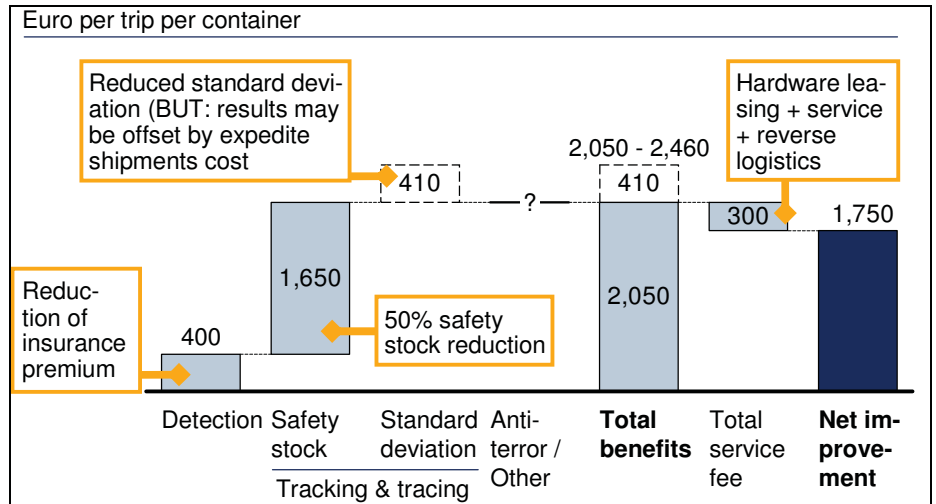


Figure 5: Expected benefits and costs per container load

costs per container load are presented in Figure 5.

Taking a conservative approach, the expected benefits in this specific case were limited to the effects from a lower insurance premium on the one hand, and a reduction of the safety stock on the other. The new visibility in the supply chain will allow for such insurance premium reductions, because claims can be directed to the party that really is responsible for damage or theft. The reduction of safety stock is possible due to the new confidence in the arrival of goods on time. This confidence is rooted in the new flexibility that in turn comes from the increased visibility. Logistics managers can now quickly react and, if necessary, expedite shipments or order replacements should they notice in real time that important goods are, for example, left behind at transshipment hubs.

The cost per smart container load is assumed to be in the order of €300 (\$475) after cost reductions from economies of scale. The resulting net improvement per container load is expected to be in the order of €1,750 (\$2,775).

It is clear that real-time systems will not help much in the global fight against terrorism, since only 10% of all

containers will initially be equipped. However, it is also clear that border controls will be much faster for smart containers, which saves time and money for the parties involved. In addition, in the event of an attack, the containers that will most likely be allowed to move again first will be the ones with smart technology implemented.

Obviously, during a real test with all the containers on a trade lane equipped with sensors, the reality will show what unforeseen problems occur and if the expected benefits will actually be noticed in the bottom line. Also, the practicability of the increased flexibility has to be proven by reality. There must be clearly defined processes and an event-based information flow in the network operations centre for the system to work perfectly and for the benefits to materialise.

Taking all these points into account, the conclusion is that real-time smart containers are definitely worth a try. Or to put it another way, ignoring this innovative technology could prove to be a risk for logistics companies, since not only would they miss out on large potential benefits, but they would also risk lagging behind in customer satisfaction. Logistics players, therefore, need to act to take advantage of the emerging smart container opportunity.