



TERMINAL AUTOMATION

THE GOOD, THE BAD AND THE FUTURE

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I entered the maritime industry 15 years ago, having spent most of my career deploying automation to factories (mainly automotive) all over the world. It was rewarding to be able to share my experiences developed in a mature setting with a more an embryonic one. A big advantage in this scenario is that my past experience allowed our team to avoid some of the developmental pains associated with the deployment of disruptive technology and focus more directly on solutions that provided immediate results. I think that was a factor in how the Virginia project – back in 2007 – was able to finish on-time and on-budget and exceed a whole host of expectations. Having said all that, I have wondered over the years whether we did the industry a disservice by not having more go wrong. At one point the APMT organization felt the entire automated terminal development process could be distilled to a “checklist” – they called it

“Terminal in a Box” (and it baffled me).

There have been articles published recently questioning the value of automation. While I have no problem with the question being raised and debated, it is disconcerting when the debate is being made to sell products or services by people who have very little first-hand experience. Hence this article and the presentation that will follow it at the upcoming CTAC19 in London. To be clear, some of this is opinion and I fully expect it to provoke a debate.

THE GOOD

The marine terminal industry *always* considers safety first. Properly implemented, automation is safer than conventional operations. The drive for safety must be paramount throughout the system design and implementation phases.

There is no doubt that automation systems are more cost effective to

operate. There is a very high rate of repeat investment by companies who deploy automation. That would not be happening if the technology was not providing an economic return. To be perfectly clear, not all costs decrease. For example, operating costs might go down while equipment maintenance costs rise. All in all, the results are positive enough to support continued deployment. That does not mean that some stakeholders are not disappointed by the results. That should not be translated into a failure of the concept, rather a failure on the part of the project sponsors to manage the expectations related to their business case.

Automation systems tend to be much more consistent than their conventional counterparts. Some have argued that consistency alone is a reason to automate. Automation systems also tend to be much more scalable (i.e. increasing capacity) on the high end. Most automated terminals



start with a first phase and scale up. London Gateway is a perfect example. If the land is available, it is pretty easy to expand the capacity of the terminal. This is probably truer as the level of automation increases. The higher the level of automation the more easily it can be scaled. The reason is that people are the most critical factor in the equation. Namely, highly skilled, reliable, disciplined people. The level of automation tends to place less demand on the people part. Do not read that as *no* people, or you will be greatly disappointed. People are *always* the key to success. Period.

THE BAD

In the interest of presenting a balanced view, the downsides (real or potential) should be considered. Most obvious is the up-front cost of automation. This is probably at least two times the cost of conventional and increases well beyond that as the level of automation increases. This is the likely driver behind the speculation about cost versus benefit. It is safe to say that not all investors have the

same payback criteria. Some might want an immediate short term payback (which is unrealistic), others might want a stable long term cash flow (i.e. pension funds), while others might want the regional economic impact of commerce, etcetera.

The industry supplying the solution components is fairly small, not particularly competitive, and plagued by commercial uncertainty. Only a few suppliers exist because there is unstable demand (boom or bust has driven a lot of small companies out of business). There is also a fairly high barrier of entry for new companies. The biggest barrier is survivability and the risk of introducing unproven concepts into a very expensive system. Supplier extinction is highly related to relationship failure between customers and suppliers. There is too much blame, threats, excuses, and lack of teamwork. The commercial risk of failure is huge on both sides of the customer/supplier relationship. Buyers beware; there are no suppliers who can pay you enough in damages to compensate for the failure of your investment. Try to avoid those cases by establishing the

proper working relationship from the outset. Pick suppliers who are partners and have a strong reputation for teamwork based projects. If you find yourself overly focused on the liquidated damages section of your contracts you probably should not be doing the project at all.

One of the biggest stumbling blocks relates to the training of the operations team. That term in this context is used in a very broad sense. That means all aspects of operations, including maintenance and IT (which might not be obvious). The larger the team, the greater the challenge. Most projects will start with an event. To sustain the startup and deploy across the organization requires support 24x365. Getting the skill level of the critical mass of people to a sustainable level takes time. The more people, the more time. Technology based systems are sensitive to skill level voids. One or two improperly trained people can make a mess. The solution to this is time and patience.

Performance metrics in some cases have been lower than expected. That is most likely due to a decision to stop focusing

on the “continuous improvement” efforts that should be fundamental to all high-level technology applications. I think of this as quitting, or wearing out, or running out of gas (automotive guy talking here). That is a decision someone makes, not a certainty of all projects.

The software requirements are very demanding. The state of the art while evolving is doing so at a very modest rate (that is a polite euphemism for tragically slow rate). The biggest challenge is a lack of knowledge about the problem at hand. The decision to outsource development puts a high emphasis on detailed specifications. If you do not understand how the process works (and most software providers do *not*) – how detailed and accurate can the specification be?

In fairness to suppliers, they get a lot of input from customers regarding requirements. That is curious since many customers do not have a clue about what they really need. This ends up causing a big problem. Customers ask for dumb things, suppliers make promises to deliver those demands to secure an order, then get beat up trying to figure out how to deliver a solution that meets expectations (see liquidated damages discussion above). Software bugs are the result of this virtually hopeless situation. The bugs drive unreliability and work arounds. The work arounds increase technical complexity and dependence on extremely skilled staff. And without an injection of common sense – disappointment is the result.

Another software trend relates to “the grass is greener” thinking. Customers are disappointed with the software status quo and figure they need a change (another supplier, or maybe a do it yourself TOS). Eventually this will all play out but in the short term this thinking adds risk.

Lastly, ‘Domain Contention’ is a term I introduced back in 2016. This is suppliers over-reaching to increase the scope of their product in the solution landscape. The more you do – the bigger the piece of pie. This is very hard to manage. It gets to the core of how businesses operate. Growth is critical, and the lack of certainty related to investments puts pressure on getting as much as possible out of the deals available. This has led to some really terrible solution architectures. For example TOS systems trying to control the exact location of equipment (to name but one). If everyone did their part, and stayed in their lane, the solutions would be more capable, reliable, cost less money, and ultimately result in more successful deployments.

THE FUTURE

It is hard to talk about the future and not start by acknowledging the increasing role

of autonomous vehicles. The maritime sector was actually an early adopter of this technology (i.e. AGVs in Europe in the mid-90s). Recently there has been increased talk of auto-strad facilities. The auto-strad value proposition trades off terminal capacity for lower operating cost for a modest investment. This may be appealing in a number of situations.

I have not heard as much discussion about the impact of autonomous vehicles on the off-terminal components of the logistics chain. That is where I think the impact could be *huge*. Imagine autonomous over-the-road trucks operating well defined delivery patterns during non-prime hours. It seems crazy that these would not be put in place before passenger cars, as this would solve so many problems with lower risk that it seems like a no brainer. Autonomous trucks fit nicely into a broader more tightly integrated supply chain, vessels arrive on time (imagine that), are consistently processed at the terminal (meeting expectations about speed and reliability), trucks and trains are serviced in a highly predictable way, contributing to reliable end to end logistics. The result, lower inventory costs and increased agility for the beneficial cargo owners (BCOs).

Most of today’s TOS software incorrectly relies on optimization algorithms. To demonstrate this in simple terms – if you are loading 200 boxes into the hatch of a ship it is crazy to think (or worry about) what’s the best order to do that (i.e. optimized). Rather, it is more appropriate to figure out how to get the 200 boxes on the ship in an acceptable order (one out of thousands of different combinations) that allows sufficient flexibility to deal with equipment breakdowns, labour shortages, uneven container distribution in the yard, late vessel arrival, contention by other cranes working the same ship, contention by cranes working different ships, and contention related to the support of other intermodal exchanges (gates and trains). The software must recognize when it is necessary to break rules (short term) to accomplish a long term result. For those who play chess – sacrifice your queen to gain a checkmate.

I have been very fortunate to work on some very capable project teams throughout my career. The teams that implemented the Virginia and New Jersey projects were very strong. Reliance on specific people will not be a sustainable solution for the anticipated growth of automation in the industry. A couple of companies have started assembling the ability to deliver “one stop” solutions by increasing their scope of supply. Thus far, combining equipment and software seems

to be making good progress. At least two sources for this are developing and will provide choices for customers in the future. The civil works is a critical aspect of the equation and that seems to be missing (and likely very hard to integrate). There is no doubt that at some point the “Terminal in a Box” idea may become a reality.

CONCLUSION

Without a doubt the terminal industry has experienced a paradigm shift since 2007 when the Virginia terminal opened. More than 20 automated terminals have been or are being built. The industry will continue to evolve. One thing that is not likely to change much is the effort it takes to create a winning solution. Plan on very long work days (14-16 hours) that span the entire week (yes, weekends too) and continue for months if not years. Plan on a pace that requires post-launch tuning and training. While the hours may eventually slow down, the focus on getting better must never stop. If you think you are done – you really are *done* (as in you are finished).

ABOUT THE AUTHOR

Rich Ceci joined VIT in May 2016 as Senior Vice President of Technology and Projects. He is currently responsible for major projects in the Port of Virginia and is leading the recently announced pair of expansion projects which will add significant capacity to the Port of Virginia and the USEC. This expansion includes advanced technology focused on improving both safety and productivity in the port. Previously Rich was VP of Information Technology for GCT USA in Bayonne NJ where he managed the Global Expansion Project, winner of several industry awards. The GEP was completed on-time and on budget and is one of the most technically advanced terminals in the US.

ABOUT THE ORGANIZATION

Virginia International Terminals, LLC provides terminal management services to the port of Virginia. The company manages, operates, and conducts business of public terminals. It also offers electronic data interchange services. The company was founded in 1982 and is based in Norfolk, Virginia. It has terminal locations in Portsmouth, Front Royal, and Newport News, Virginia.

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