

Accelerating Expertise in agile decision making for business with iterative failure in a dynamic naturalistic virtual business.

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ABSTRACT

Maxx Appliances is an online Multi-player “game” specially designed to accelerate the expertise in agile business decision making, an important skill in increasingly complex business environments. The activities are based on the author’s research on how iterative cycles of trial and error with feedback accelerates the acquisition of expertise in some domains. The exercise in this case was agile decision making in highly volatile business environments, where quick evaluation of changing information and distributed decision making is required. The multi-player platform has been used to successfully scale the approach, but still requires about 16 to 20 hours of online time. The experiment described here was to explore a novel use of “traffic light” feedback, a form of minimalist instruction, in addition to other kinds of feedback. The current trial – described here – showed that people developed expertise associated with years of experience, in only six hours over two sessions.

KEYWORDS

Decision Making; Accelerated expertise; business expertise; Agile, virtual worlds.

THE COGNITIVE SCIENCE OF ACCELERATED LEARNING.

We have been studying ways to accelerate learning in business domains for nearly two decades. The basic idea behind our work is a form of learning by doing. But over the years, this has been refined to be a specific purified version. I.e., an approach involving a special kind of iterative trial and error « opportunity space » with minimalist instruction heavily laden with dynamic feedback. It turns out, developing advanced expertise involves experiencing the right number of cycles and the right kind of cycles with immediate feedback. Our studies showed this was more important than chronological time. Our research has been focussed on studying the nature and impact of effective cycles and problem spaces. Our hypothesis is that iterative cycles of trial and error put the brain on overdrive and tap into the adaptive unconscious, which is purported to learn 200,000 times faster than the conscious part of the brain, but which is also difficult to direct (Wilson et.al 2008). Our innovation is developing environments which direct the focus of the adaptive unconscious through iterative trial and error with a goal as its guide, usually under time pressure and stress (DiBello 2019).

There are interesting parallels with Advanced A.I. Advanced A.I. computers use millions of cycles of trial and error to out-perform ordinary A.I. (which is programmed with a starting algorithm) but the idea is the same; endless opportunities for iterative trial and error against a goal. The difference between advanced A.I. and human beings is that human beings require about 60-100 trial and error cycles in a compressed time frame to get the same result. Why so few? Probably because with each cycle we are likely experiencing many thousands more implicit cycles at the level of the adaptive unconscious. How that works is the topic of a whole different paper, but an easy way to understand it is that every time you try something, especially under pressure, every experience you’ve ever had that is remotely similar is brought to bear -- in parallel -- when trying to figure out an approach to the problem. We assimilate our past (in sense of Piaget 1977, and described by Campbell and DiBello 1996) to every new situation and look for any semblance of a fit just to get started with our experimentation process. This is how the human brain works. A computer does not have this advantage and must go through a linear sequence to eliminate millions of options.

For several years now, WTRI has reliably been able to get expertise typically associated with 2-5 years of experience as measured by other rubrics used to measure capability, (such as the GE Competency Model and other similar capability development models; see Stamoulis, 2015) after 16 hours of using a kind of « virtual rehearsal » method in which people rehearse a situation beyond their capabilities in an attempt to develop expertise. (DiBello, 2019, DiBello & Missildine 2011 ; DiBello et. al 2011; Hoffman et al 2014). With our latest attempt, we got the same effect with less than 5 hours in some cases and no more than 6 hours in all cases. This paper is a discussion of what we did differently and why we may have gotten this effect.

WHAT IS MAXX?



Figure 1

Maxx is an immersive experience in 3D virtual environment that is multi-player or single player. The team members are represented as themselves with modifiable avatars and work in a replica of the Maxx company which includes a website (Figure 1) headquarters in a city, a factory, surrounding buildings and streets, parks and other areas (Figure 2). The graphics are not as high fidelity or photo-realistic as, for example, one of our mining worlds, or a factory system, but it was assembled to require no special graphics capability in order to run on any computer. The goal was a scalable affordable product for large numbers of people. Further, because the world is meant to focus people on the relatively abstract activity of influencing others, business decisions, and the long tail risk of various moving parts a fast moving consumer economy, we wanted the focus of their situation assessment skills (in the sense of Klein 1993; 1998) to be at a high level of abstraction. In contrast, when developing worlds for safety or emergency response, we want the focus of the user's attention to be on the immediate environment. In those cases, photo realism is a priority.

The Maxx "company" is richly represented; the website has an annual report, internal memos, financial performance reports and documents telling its history. Challenges are realistic, very difficult, and replicate the kinds of events that put major efforts at risk. Events are slightly different for each team, with variation generated by a special Event Generator.

The team members log in from their own computers from anywhere, and meet in the Maxx world as a team, interacting to make Maxx Inc. successful. The story unfolds over a period of compressed "months". The team works together in the Maxx world according to a convenient schedule. The team meets in the world with a facilitator at scheduled times and can get access the help desk with technical problems anytime. In the single player version, the participant manages a robotic team alone.

The Maxx Appliance company wishes to compete in the marketplace with Innovative "smart" appliances that meet consumer's needs. The year is some time in the future. The Internet of Things has reached mature levels. "Smart appliances" occupy a heavily competitive space. The company, which is small compared to its competitors, is losing its position. Rapid product development and launch is critical to repositioning the company in their competitive space at a much higher level of profitability.

Because the team will be accountable for Maxx Appliance's success they must:

- choose the right features for development; they will not have enough resources to develop them all
- change course when the market indicates a change is needed.
- choose features that can be manufactured and sourced in the countries where their products are sold.
- The participants' judgments, interactions, and influencing skills are scored using an agreed upon leadership model Some interpersonal interactions may also adversely affect the financial performance of the company. Metrics are embedded and instant with special dashboards. For this trial we used the popular agile leadership « Agile Manifesto » and the scorable skills that comprise it.). However, the product is designed to use any scorable standard of behavior that can be linked to an outcome. An example of an « agile » skill is seeking information that will lead to a better business decision and using it to change course when it will result in a better outcome.

Opportunities for finding this kind of information were seeded into the activity, and conversely, consequences of not finding and using it were also part of the experience.

To win, the team has to introduce a new product for Maxx, making decisions over multiple sessions. In this exercise, the team must manage the development of a competitive product and also the product launch. Given that the IoT space is mature, it must be a “game changing” product that competes against numerous other consumer choices. Their goal is growing the company as an agile enterprise from 6% ROS to 14% ROS.

Each team or single player participant gets two tries to make the business goals successful. The participants are accountable for the success of their project teams and team leads as well as other aspects of strategy. They are not project managers, but they make executive decisions about the kind of project management approaches that will be used and the skills and priorities of the project leaders; if they make the wrong calls, the business will suffer or fail.

With Maxx, we experimented with accelerating the rate at which people learn by increasing the factors that we think contribute to expertise. For example, increasing the richness, variety and immediacy of the feedback. A participant can find out how they are affecting the value of the Maxx company on several dimensions, immediately, and in more than one way after every action taken. Further, *they must take an action with a value creation ripple effect every few minutes*. In summary, we wanted to test the idea that the increased pace, frequency of actions with ripple effect consequences and multiple forms of immediate feedback would push the limits of accelerated learning.

Related to this, the Platform that Maxx is built on has advanced behavioral tracking, which enables this sophisticated linking of action and consequence, so people can learn from everything they do. However, there is an added benefit; we can also learn from large numbers of people in terms of what is working for them, what is not, and what is moving the needle on their development into more expert areas of performance.



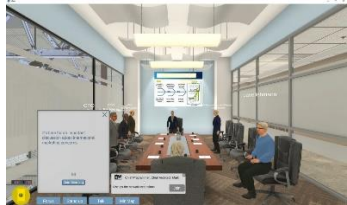


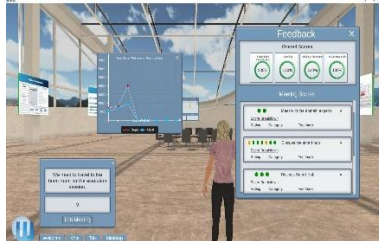
		
Headquarters viewed from the street	Developers room	Meeting with stakeholders
		
factory	City park	Viewing dashboards

Figure 2

A little bit of background

What makes Maxx possible is the platform it sits on. This is the FutureView™ Suite (Figure 3). This is the result of 15 years of funded research by the WTRI team. Virtual Worlds have been expensive to build, have had the constraints that all game engines face, and in general were not built to be means to an end, but rather as ends in themselves. Wrestling them to the ground for other purposes has been challenging. In the end, we built our own platform, where the emphasis was not the “world” but rather on the technologies that are attached to it, with the “world” being an optional outcome that could take nearly limitless forms, from small environments for meetings or learning to make better decisions to huge mining operations for rehearsing billion dollar options with entire fleets of equipment and processing plants with hundreds of people logging in as avatars. The core idea is a unified platform with a stable core, modifiable layers and lots of movable pieces that easily permit endless possibilities. The whole thing resides in the Cloud. With this platform you could ask any “what if?” question you needed answering without real life risk, at roughly 5% the cost of other similar approaches, and in much less time.

FUTUREVIEW™ SOFTWARE SUITE ELEMENTS

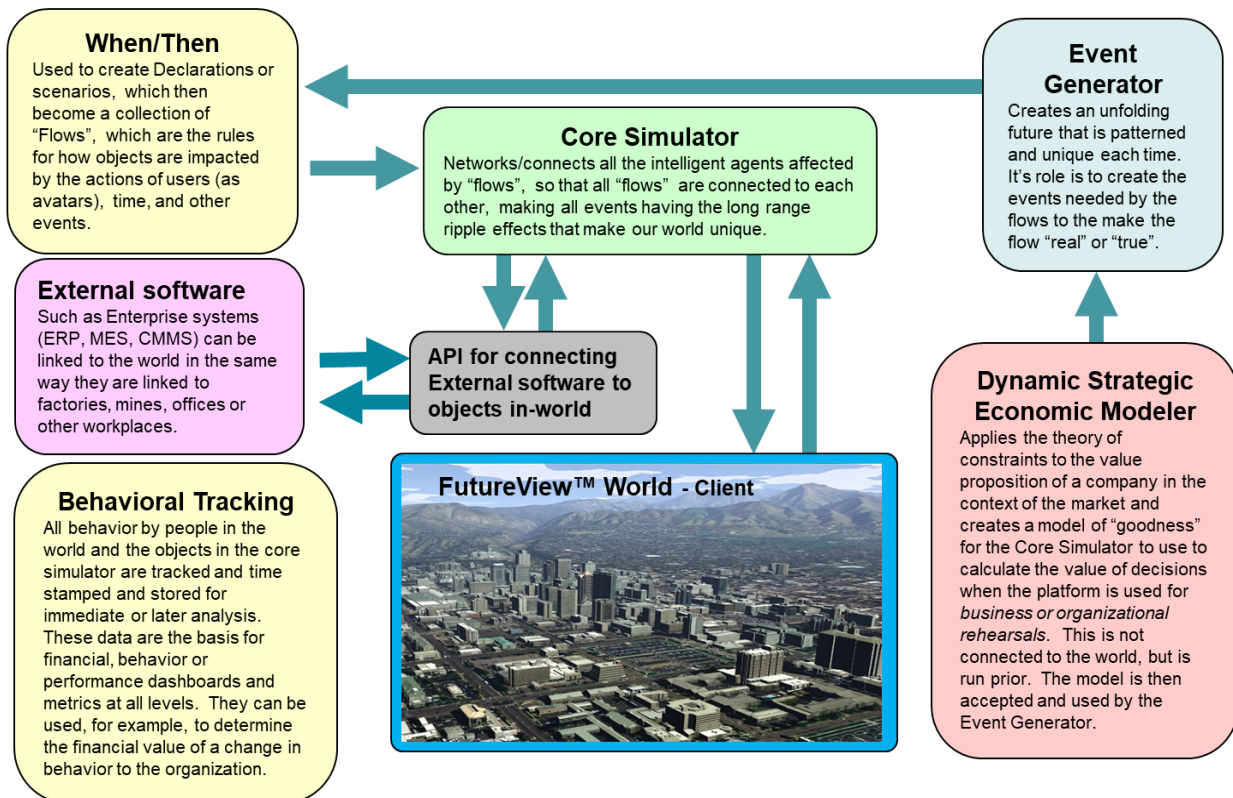


Figure 3

Capability building experiences and virtual worlds for rehearsing the future. Easily created and easily modified.

A STUDY OF ACCELERATED LEARNING WITH MAXX

Who participated? In this study, there were 10 teams of 4 people each doing the activity together, and 31 people doing the exercise as individuals. As indicated, Maxx was designed so that when an individual or team performs well at the challenges facing the Maxx Company in the marketplace, they have developed judgement, mental simulation capability and stakeholder influencing capabilities of someone who has 3-4 years seasoning as a leader in an agile organization. The participants in the pilot were junior managers and relatively unseasoned in agile approaches or managing performance in volatile markets. In other words, they had not worked for organizations which require agile thinking in order to remain competitive.

What support did they get? Other than a help desk for technical issues, their dashboard, and detailed reports on their performance, both types of learners had the benefit of two features of Maxx, which are optional add-ons, but which were required for these participants.

1. Extra Assignments to help them think about what they were learning and how it related to their jobs, such as short papers and essays they need to turn in by a certain time. These were posted to a website, and the virtual assistant (Wendy) can be instructed by a facilitator to remind participants which ones are due by when.
2. Access to their reports, detailed or high level, or both. These were automatically generated and participants could get them anytime.
3. Access to three kinds of feedback in the world itself, including detailed dashboards.
4. An experienced manager who met with them between session One and Session Two to discuss their results and answer questions they had before doing Round Two.

The participants were scored on two separate dimensions:

1. The return on sales as a result of their business decisions. Their goal was to go from 5.5% Ros to 14% ROS or better with the deployment of the technology. For the owners, that would mean a net dividend of \$20Million a year to over \$120Million. For a small company trying compete in the IoT space against appliance giants, this is quite significant.
2. Their judgments, behavior and way of managing people was scored using the capabilities associated with agile leadership and agile management. These are the "soft skill" scores. In some cases, there was overlap. For

example, a poorly handled meeting could result in information needed for an informed business decision not being revealed.

The exercise takes no more than 3 hours each round. Each individual or team did it twice. We encouraged everyone to experiment with whatever they thought might work the first time through and not overthink things. It's supposed to be hard. The teams had two weeks to coordinate and schedule their inworld time together. The individuals had two weeks to get both sessions done.

Traffic light feedback

An interesting feature of Maxx is the Wendy app, a large “W” in the lower left the screen which, when clicked, accesses a number of handy tools, including the detailed dashboard, documents, a schedule and so on (Figure 4). We decided to have this large icon glow red, yellow or green depending on how the players were handling a given situation. The Icon, which is normally blue, would glow “red” if the participants were not handling the situation well, yellow if their handling was “okay” but not at the level of a seasoned expert, and “green” if it was handled the way a seasoned agile manager would conduct himself or herself.

We verified our scoring scheme for the “color glow” using experienced practicing agile managers, not agile coaches. Our feeling is that not all agile coaches have been managers and we wanted to have a scoring scheme road tested by those who had run companies. None of senior managers had access to the scoring scheme during the score testing. They simply did the exercise, having no insight into the reason for the colors. When all agreed on the “all green” set of behaviors we had our “upside” defined.

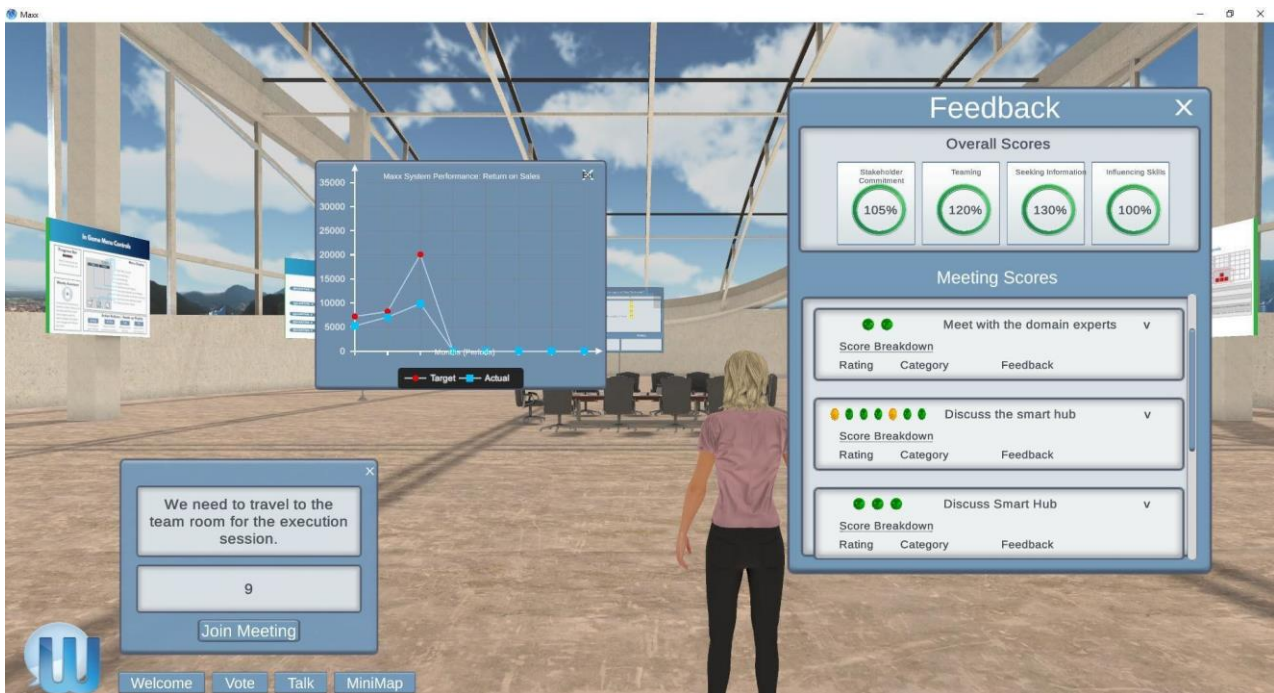


Figure 4

View of participant pulling up her HUD to see how she's doing on financials and soft skills

What happened?

Teams

As we suspected, the teams of four did better on the first round, and improved markedly on the second round, achieving the desired ROS and averaging about 18% improvement in the quality of their agile judgements. All achieved the planned “upside”, showing judgement, as a team, associated with 3-4 years of experience on skills in the Agile Manifesto. The change was statistically significant despite the small number of teams ($N= 10, df= 1, p<.007$).

Their soft skills improvements had an effect on their business decision improvements in round two. On the other hand, being on a team insulated the group somewhat from being a complete disaster during the first round. Having others to talk to helps a lot, it turns out. Since Maxx took advantage of FutureView™'s “voting tools” which requires consensus for major decisions before the game can advance, discussion and debate had to occur and no one participant can take over. Also, there were a fair amount of activities happening at the same time (meetings with developers, focus groups and so on) so the team broke up and came back together to share what they had learned. In effect, learning from each other is not optional.

The teams also had more fun. They took the instruction: "don't be afraid to try what you think might work the first time through" seriously and were able to laugh at their mistakes and tell the facilitator funny stories about it later.

The glowing Icon in the lower left did help; as the team advanced they could see when they were off track when the icon glowed red, and gradually the frequency of red glows diminished, and green was much more frequent. This is important because no interpretation is ever given to the team. They only know that their theory of the action is right or wrong, but not why exactly. The idea of the red icon is to force them to question their assumptions. All in all, the capability development shown here in the difference from time one to time two indicates the value of experience, especially considering the kinds of activities involved, evaluating risks, influencing stakeholders and supporting team leaders who look up to you for support.

Many junior managers don't get opportunities to "rehearse" those typical situations and made typical mistakes typical of unseasoned managers that they got to learn from.

Individuals

As we expected, individuals very much struggled. Maxx is a difficult exercise and we got many calls for support – not with the technology, but with their anxiety. For one thing, it is harder to experiment and make mistakes without fear when you are doing something like this alone. However, once we got people over this hump, their statistically significant "jump" was higher than the teams' and higher than we expected, about 20% on average, with some individuals being much higher and with greater significance than the teams ($N= 31$, $df= 1$, $p<.00016$). All these individuals also met or exceeded the business benefits for Maxx.

This was a very unexpected result; individuals generally struggle more. However, when we look at what happened with the Wendy icon in the lower left, we get some clue as to why this might have happened. It seems individual participants were very sensitive to this indicator as opposed to teams. With teams, there is the possibility of a by-stander effect. You are not alone, everything is not your doing. The glowing icon is annoying, but it's not entirely about you. When you are alone, all the feedback, especially the immediate feedback, is about you. When you have the wrong theory of the situation, you find out instantly, and you don't get much help in creating a new one. For that, you are on your own. For these individuals, the icon may have had a profound effect. Our system logs indicate very few of them had anything but Green once they were halfway through, and were nearly all green in the second round. We got a couple of phone calls from people defending a red glow, obviously very upset.

We know the brain does not like to be wrong; when we sense our theory of the world is wrong, we immediately go into automatically seeking a new perspective without having to make a conscious choice to do so. This tendency is much stronger when we are either alone or in the role of accountability. Our adaptive unconscious sees being wrong about our theory of the world as a threat to survival; we work quickly to correct it.

Does this all transfer back to real work? The short answer is yes. In our work with 53 clients learning this way does transfer back to real work, immediately and with financial benefits. The closer the capability learned is to what the business needs, the better. What's new here is the speed of learning.

What does this all mean?

Expertise can develop faster than we thought possible. Teams are best for the debate, shared learning and the psychological safety of learning through failing that is key to accelerated learning. But it seems that iterative failure is still the most powerful way for the individual to learn, although more frightening. Finding ways to overcome fear of failure are well worth pursuing. Instant minimalist feedback may be a way for accelerated learning technologies to kickstart the brain to reorganize itself and bypass anxiety. This is a remarkable achievement as we whittle closer to the the fundamental mechanisms of accelerated learning, and more important, develop a technology that activates these mechanisms reliably in large numbers of people. It is unfortunate that we as individuals are afraid of experimentation, even when we are supposed to be having fun doing it, but the results here show that at least our brains have other ideas and respond well to simple instant feedback to override our resistance to learning.

The study also shows promise for using virtual environments to help focus and constrain the problem space needed for iterative learning. Although the Maxx World is not nearly as complex as the real world, it is experienced as rich and engaging. Our participants report that they feel they are « really there ». The reality that is is not as full of distractions as the real world frees the participate to discover what we want them to learn through a form of free-form iterative trial and error.

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