

Extending Cognition and Accelerating the Development of Expertise using The FutureView™ 3D Platform; An Example.

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ABSTRACT

For decades, our team has explored accelerating expertise through a specific kind of “gamification”, which emphasizes unstructured tasks with high stakes “non-negotiable” goals and opportunities for rapid trial and error iteration. This approach – although new – has deep roots in long standing research on expertise and the cognitive mechanisms involved, which we have discussed in other work. Over time, we developed a platform automating our approach –FutureView™. Two uses have emerged:

1. Solving problems in corporations which are very complex, and which are solved more efficiently by exploring options in 3D, through iterative trial and error, usually as a collaborative team.
2. Developing expertise more rapidly in what would be considered relatively “bounded” domains, where the hallmarks of expertise are well known.

In this paper, we discuss one of these uses and explore ways that such technologies have even more potential to extend cognition in various ways as these platforms evolve.

KEYWORDS

Uncertainty Management, Business intelligence, Expertise, Human-Centered and Work-Centered Design, MetaVerse for businesses, wicked problems

INTRODUCTION

For decades, our team has explored accelerating expertise through a specific kind of “gamification”, which emphasizes unstructured tasks with high stakes “non-negotiable” goals and opportunities for rapid trial and error iteration. This approach – although new – has deep roots in long standing research on expertise (e.g., Chi, Glaser and Farr, 1988) and the cognitive mechanisms involved, which we have discussed in other work (e.g., DiBello 2011; DiBello 2019; Hoffman et. al 2014). Our research shows that this approach results in the development of deep domain expertise. In 2007, we incorporated the use of Massive Multi-player virtual worlds with advanced behaviour tracking and instant feedback as a way of increasing the power of this method and scaling it. Over time, we developed a platform automating our approach –FutureView™. Two uses have emerged:

Expert Worlds : Developing expertise more rapidly in what would be considered relatively “bounded” domains. Examples of these include project management, IT deployment for supply chain efficiency, understanding and managing risks in changing insurance markets with globalization, maximizing returns in mining, and even issues such as psychologically safe leadership, inclusion, and leadership approaches that promote innovative team practices, to name a few.

Mega Worlds : Solving problems in corporations which are very complex, and which are solved more efficiently by exploring options in 3D, through iterative trial and error, usually as a collaborative team. These approaches go beyond “digital” twins which are models that users can observe, but which are not immersive. Rather, our models can be « entered » in that people can log in as avatars, which allows reality analogous operating environments to be tested against contact with human actors trying out a new approach or a change in a workplace. Specifically, the *immersive participation of actual workers, customers or stakeholders executing proposed strategies or even company designs “inworld”* allows all to see if the proposed plan will survive reality – and more to the point – contact with human actors. The 3Dplatform, if rich enough, can both serve as places to “rehearse” what-if ideas, and as ways to cognitively extend the team’s ability to think about complex options (DiBello et al 2020).

Further, these iterative rehearsals have sometimes resulted in the discovery of an entirely new approach to running a particular business. A third usage has therefore emerged, related to the two above ; exploring *new approaches to difficult problems by using the 3D environment itself as a tool to do so*. Specifically, massive 3D environments that are connected to outside data sources make possible business models that are too complex to understand or implement without the assistance of 3D environments.

In what follows we present an example of what we have done with an “expert world residing on the FutureView™ Platform in order to illustrate how A.I. assisted 3D environments can extend our thinking and accelerate the development of new capabilities.

ACCELERATING EXPERTISE AND LINKING SOFT SKILLS TO BUSINESS OUTCOMES:

For most of our team’s history, we have been working on the performance of companies, and mostly focussed on quantitative results. We have had some remarkable achievements in this area; In 2010 we were able to help SwissRe double its stock price after the senior leadership collectively rehearsed new strategies for recovering from the subprime mortgage crisis, which significantly devalued the company and threatened their bond rating. We saved mining companies \$Billions by allowing them to rehearse expensive options virtually instead of making irreversible decisions in real life. In other cases, we helped failing companies with turnarounds (DiBello 2020). More than one medical device and biotech company was sold for \$Billions because of our work. Other examples are too numerous to mention.

While doing all of this we notice that the people going through our rehearsals were changing as individuals. Our first attempt to study the impact on individuals and teams and link financial outcomes was done as collaborative project with IBM Research and IBM Global Business Services. (DiBello & Missildine 2013; DiBello & Missildine 2011). Teams of project managers working overseas who were trying to adapt their technical skills to the IBM engagement model of providing value to a customer’s business through a project were not succeeding. Traditional training was not getting through.

We gave them the opportunity to rehearse a value creation project management model with a fictional autoparts customer in a virtual world, where the customer’s success with business goals was a direct result of the manner in which a technology implementation was managed. This virtual business was based on a real business we had worked with and we included the publicly available financial data. The team’s success was not only measured by normal project management metrics but also against the customer’s strategic goals for the business’s multi-national distribution of its products. This resulted in a dramatic elevation in the team’s skill. Follow-up research also revealed it resulted in an elevation of individuals’ skills as well. In hindsight, this should not have been surprising to us, but it was. We were accustomed to thinking of our unit of analysis as the team, or even the firm.

Since then, we have been exploring scalable applications which focus on individual development for businesses, placing expertise in the context of business outcomes (i.e. something financial) through algorithms that vertically integrate the relationship between behaviour and the vertical and horizontal financial ripple effects. (e.g. DiBello 2020; DiBello & Raisinghani 2019).

As a result of success in accelerating expertise in these “bounded” domains, we are developing applications and conducting pilots where the hallmarks of expertise are known; i.e., the behaviors of an “expert” and the impact on the value of an organization are mapped. These examples include agile leadership, product management, and IT strategy navigation for corporations. These are situations where, in the past, we would create a custom rehearsal, but where we now see the value of something more generic. The goal is more affordable, scalable accelerated learning technologies that can reach more people.

A description of the technology that makes this possible to do this is beyond the scope of this paper; briefly, it is based on our FutureView™ Event Generation system with some economic modelling capability and the Agent based nature of our technology platform. From the user’s point of view, it allows users to see how one’s own given way of making business decisions, behaving, leading teams, interacting with customers or managing community issues (such as in mining) can have a direct long-term impact on the value of the company. Important to note, it can give the user this feedback instantly, instead of over a long period of time. The same “rehearsal” is also highly reusable; due to the Event Generator, it is possible to vary the context and unfolding future of each instantiation while maintaining the core of the scenario so that it is not possible to rely on memorization to improve performance over time. This results in first principles learning and high transfer back to real life work.

The goal of this paper is to give readers an insight into how this all might work. In the example below, managers working for a large, multi-country mining company are trying to achieve a higher level of expertise on a specific expertise scale used by many companies to classify its leaders level of management skill. The scale has six levels and these managers are at level 3 or 4, attempting to be “pulled forward” to level 5 thinking, which would qualify them to run an entire operation with hundreds or even thousands of employees. The rehearsal exercise is

accomplished by having them lead mining teams (manned by A.I. “bots”) through various complex scenarios in which they are confronted with relatively difficult decisions.

Some background: In many countries, mining companies have to show that they are performing within good “ESG” guidelines, protecting the environment, operating with safety in mind, and governing the operation with good citizenship in mind, which usually means maintaining a good relationship with surrounding communities. All of these can take various forms and sometimes can be complex. In underdeveloped parts of the world this can mean actually building schools and providing jobs and job training to people who live very nearby. At minimum it means not being a source of air, water or noise pollution or desecrating sacred lands. Political or community outreach may be required at different levels. At the same time, costs must be controlled, the mineral being mined must be extracted and schedules must be kept; these too can fluctuate with changes in costs to operate and mineral price values on the stock market. Juggling these responsibilities while at the same time running the mine at the profit can only be accomplished with a proactive form of leadership that sends a message to large numbers of workers what standard of behaviour is expected of them. The relationship between good leadership and better financial results are well known, but connecting those dots implicitly in the minds of managers normally takes years of experience. FutureView™ rehearsals in compressed time can accelerate and de-risk the needed experience.

In this exercise, at least 60 challenges are thrown at managers as they go about a typical week of running the mining operation – in this case one underground block cave mine and one open pit. Time is compressed; the actual exercise takes about four hours and is rarely played through in one sitting. In the control room for the company, the users can see four other mines’ activity on large billboards and others are controlling and working with the data from those mines. This provides big picture context for their decisions. The platform is flexible; we have the ability to change the HUD and billboard to suit each company without making other dramatic changes. We can also vary the scenarios, type of leadership model, and scoring scheme used to score behaviour’s desirability according to the company’s culture or the challenges it’s facing.

Figure 1. Players in the control room where there are feeds from four mines



Figure 2. Dashboards, which are also viewable as HUDs in this case also show on the wall in a meeting room



Figure 3 Closeup of Dashboard showing that the team did not meet the financial goal the first time through due to a number of sub-par decisions (shown with a high level score of red).



Figure 4. Engineers working on other mines. These are A.I. bots



Figure 5 Managers going through the rehearsal the second time in the underground mine



Figure 6. Managers going through the rehearsal the second time in the underground mine



Figure 7. the Open Pit Mine Birds Eye view.



Figure 8. Workers in the open pit mine driving to the crusher on the night shift



Figure 9. Two views of Progress being automatically tracked during the second rehearsal; workers get immediate feedback as a color and can drill down for detail.



RESULTS SO FAR

We have only begun using this new virtual world rehearsal with select mining companies. With very early studies the results are typical of what we have seen with other applications, such as leadership (DiBello 2019) and project management (DiBello & Raisinghani 2019) in terms of Time One and Time Two performance. Expertise is accelerated by 2-3 years as indicated by quality of decisions “inworld”. The challenge will be seeing how the participants do back at work. The subjects of the current studies are living in multiple countries, but are going through the experience together; the companies using this application are hoping to develop in these managers a unified understanding of their company’s approach to ESG accountability. At one large company the plan is to roll this application out to large numbers of managers worldwide as a standard method of management employee development. If this works, it could greatly assist the company in adapting to the rapid changes taking place in the world’s mining business, especially with regard to adapting to ESG requirements.

CONCLUSION

We have described one application of the FutureView technology here as a way of illustrating how something that was developed for one purpose – improving the performance of a company – has landed on a new purpose through a combination of evolving technology (the smart metaverse) and empirical findings of what happens to the people who are changed by using it. We think there are more things to come. We see that companies using our Mega-worlds may not just use them to wargame or rehearse options in 3D, but may also eventually use connected versions of our 3D worlds to actually run companies. For example, we see the potential for doing this with some version of our mining control room now, which has the capacity to connect data from actual mining operations remotely located and centralize meeting and decision making among people who are also remotely located. We are excited to see where the technology and the ways that people discover to use it will take us next.

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