

Digital Tutor Veterans Pilot Program

Graduate Survey 30 Months Post-Graduation Evidence of Effectiveness

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EXECUTIVE SUMMARY

Acuitus's objective is to fundamentally transform education, by an order of magnitude, *for all*.

This means taking students with weak prior education, little to no prior experience, and quickly having them perform, cognitively and emotionally, at the level of experts in their field – and achieving this for all students, in months, rather than what historically happens in years if at all.

The following summarizes the results of a five-month education intervention, with 129 adults, creating senior level System and Network IT engineers from a pool of Veterans who were unemployed or

significantly underemployed, had no relevant technical experience, with prior educations evenly distributed among high-school, partial college, and 4-year graduates. These graduates then sought employment as commercial ITs. The data summarized shows the initial employment results six months after graduation and the latest follow-up survey conducted after 30 months.

The overall results are singular and exceptional, especially given incoming Veterans were often destitute, had the pressure of supporting a family, had no technical background, weak education, and rarely considered IT as a career possibility.

Specifically,

- 98% of the students graduated on-time, despite this being an exceptionally challenging and demanding school;
- Over 90% were employed within 6 months, in their field of study;
- Prior education level was not a predictor of employment; it was a predictor of initial salary, but not of compensation growth once employed;
- Fewer than 3% of employed graduates were unemployed after two and a half years;
- Salaries have been increasing at a compound annual rate of 14%, three times the average for IT;
- Graduates have been employed by over fifty companies in 15 states, working in 10 different job categories, in 50 different job positions;
- The average salary is \$73K; and
- 10% of graduates now earn over \$100K annually, with 15% now in management roles; in IT, managers earn an average of double what individual contributors earn (\$132K), so entering management is a significant milestone for graduates.

These results represent a dramatic improvement compared to any other educational program, especially given the focus on students (1) with weak educational backgrounds and (2) taking them to a senior-level of competence. Secondly, given the intensity, duration, pace and high performance required to graduate from this school, the graduation rate is exceptional. Moreover, these results are achieved using, and because of, an artificial intelligence platform that is responsible for all core education across a thousand hours of content – providing universal access at a uniform, exceptional level of quality. These results demonstrate the efficacy and the scalability required to transform education.

A major initial challenge that results from this program has been the appropriate placement of graduates. A reasonable hiring manager will typically think: ‘You have only been in school for six-months, you are at best equivalent to a college freshman,’ then offer an entry-level position. The data prior to this study, however, unarguably demonstrated that graduates of this program have the academic and hands-on, real-world job experience of someone with five to ten years of experience. Thus, the significant salary increases of 14% across the board, the continued employment of this population and the steady promotion into management demonstrates the solid educational foundation the graduates now have.

Several Veteran graduates’ stories illustrate this point:

- A former Marine, immediately upon graduation, joined the Amazon new-facility team, with the expectation that after a year he would lead his own team building out Fulfillment Centers, the 4M square foot, 3,000 employee IT-centric warehouses. Almost immediately, both of his immediate

managers left the company, making him the team leader. He delivered two facilities on-budget and on-schedule. He was then selected to lead the team that did the first warehouse conversion to KIVA robots, selected from among hundreds of more-senior ITs

- A former Soldier graduated and joined EMC in a strategic-customer help-desk position, requiring 8 to 10 years of experience. Within six months he was promoted to a level-3 position, responsible solely for managing internal ITs.
- A former Sailor applied for a senior-level position at eBay; he was ranked first among 50 Silicon Valley IT applicants. Within six months he was leading a team of five, and responsible for new-technology system upgrades outside of the United States.
- USAA hires 100 ITs each year. Their first Acuitus hire was ranked their top IT hire for the year. Going forward, USAA has proposed hiring ITs predominantly from this program.

Of note, each of these graduates took positions working on systems that were significantly different than the systems they used in their coursework. Each succeeded because they deeply understand the concepts underpinning IT, have developed the reasoning and judgement required to work at a senior level in this field, have developed the requisite confidence, and now have the learning skills to master any subject – all critical for success in a demanding, leading-edge, technical career.

BACKGROUND

The Acuitus Information Technology (IT) Educational Program was conceived in concert with DARPA, initially for the training of incoming Navy ITs, who were typically high school graduates with no prior exposure to or experience with IT. Over a period of three years, Acuitus developed a full IT curriculum to teach the five hundred core ideas of IT, initially using world-class subject matter experts in one-to-one tutorial settings, but eventually migrating to its artificial intelligence platform running a Digital Tutor in place of the human tutor.

In the course of the next few years, several hundred Navy sailors attended the school. All graduated and went on to IT deployments on Navy ships around the world. The Navy and DARPA then conducted rigorous analysis of the results achieved by Acuitus, in the form of exhaustive, multi-day competitions testing every aspect of the Acuitus graduate's knowledge, skills and competence, compared with teams of Fleet expert ITs with 5 to 10 years of experience. The results of these competitions were stunning and unequivocal – Acuitus graduates outperformed both Fleet experts and traditionally trained Sailors by a wide margin (see next section).

These results prove the Acuitus emphasis on teaching fundamental concepts followed by immediate hands-on application of those ideas to realistic, often complex problems, gave students a profoundly more robust education than other approaches, and that migration of the teaching platform from human tutors to the Digital Tutor not only maintained pedagogical “quality” but improved it compared to human tutors. Acuitus graduates leave the school with a level of knowledge about IT that far surpasses entry level requirements (as evidenced by their performance against Fleet experts), and are capable of being productive from day one, in complex operational IT environments. They also graduate with a profound increase in self-confidence, which enables them to perform extremely well in real-world jobs.

These findings have been fully supported by the experience of Veterans who have attended the school over the last three years. During that time, Acuitus has educated more than one hundred able-bodied Veterans and thirty service-disabled Veterans. The same outstanding educational results have been achieved as with active-duty Sailors, but in this case the added validation of those results has been the job placement and performance of the students in the commercial IT sector. As shown in section three below, these results have been nothing short of outstanding, especially in comparison with graduation, placement salary and on-the-job performance of IT graduates from other programs.

EVIDENCE FROM NAVY TRIALS AND PRODUCTION DEPLOYMENT

The Acuitus IT program, using the Digital Tutor, has been thoroughly tested in multiple Navy competitions. As a result of its success, it is now used to educate hundreds of incoming Navy IT professionals each year. Multiple 2014 studies conducted by the Institute for Defense Analyses (IDA) verified effectiveness by comparing the performance of incoming Navy sailors educated by Acuitus, with Fleet IT professionals with multi-year experience, as well as with the Navy’s traditionally IT trained sailors, during competitions spanning multiple days. The results were clear, statistically significant ($p=0.0001$), and reflected a very large effect size, as detailed in the Appendix to this document. The table below summarizes key statistics measured by IDA.

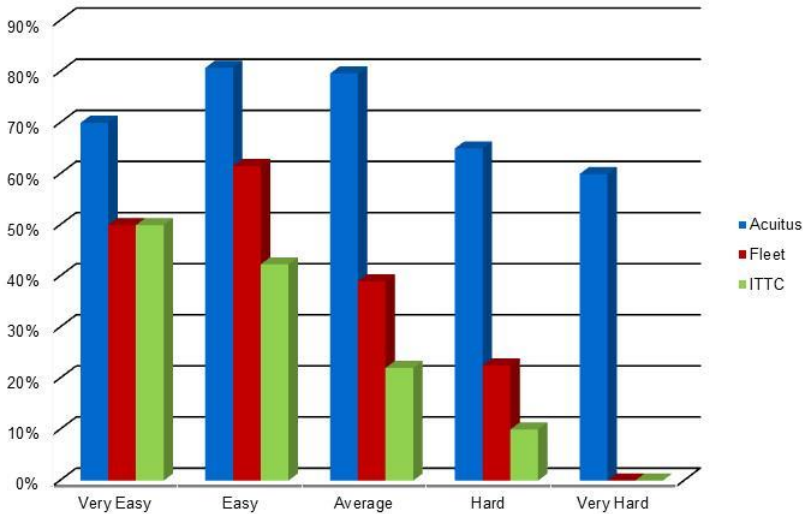
Performance Measure	Direction of Effect	Significance	Effect Size	Goal
Acuitus (DT) versus Fleet Experts (FE)				
Problem solving (PS) total score	DT>FE	<.0001	4.19	Large positive effect
PS harmful actions	DT>FE	<.0001	-1.85	Large negative effect
PS Unnecessary steps	DT>FE	<.0001	-2.26	Large negative effect
Review Board	DT>FE	<.01	1.07	Large positive effect
Security expertise	DT>FE	NS	-.97	Large positive effect
Network design & devp.	DT>FE	NS	0.74	Large positive effect
Knowledge Test	DT>FE	<.0001	3.11	Large positive effect
Acuitus (DT) versus Navy IT Training Continuum Graduates (ITTC)				
Problem solving (PS) total score	DT>ITTC	<.0001	7.98	Large positive effect
PS harmful actions	DT>ITTC	<.01	-1.63	Large negative effect
PS Unnecessary steps	DT>ITTC	<.0001	-2.10	Large negative effect
Review Board	DT>ITTC	<.05	0.89	Large positive effect
Security expertise	DT>ITTC	NS	-0.03	Large positive effect
Network design & devp.	DT>ITTC	<.01	1.52	Large positive effect
Knowledge Test	DT>ITTC	<.0001	3.54	Large positive effect

Source: Institute for Defense Analytics: Accelerating Development of Expertise: A Digital Tutor for Navy Technical Training, IDA Document D-5358 Log: H 14-001221/1

Effect size above is measured as:
$$\frac{\text{Average score of A} - \text{Average score of B}}{\text{Standard Deviation of A}}$$

Notably, the Acuitus Digital Tutor students outscored Fleet ITs, with years of on-the-job training, by substantial margins in job-sample, practical exercises. The Digital Tutor graduates also substantively outscored the traditionally trained sailors from the Navy IT Training Continuum (ITTC), who had spent more than twice the time in training. On troubleshooting competitions, the Acuitus students’ relative advantage, in terms of the number of problems solved, increased as the problems got harder, even against the much more “experienced” Fleet experts, as indicated below.

Tickets Correct



These trials and evidence base led the Navy to invest in an Acuitus school which is currently operational in Pensacola, FL; and led the Veterans Administration to invest in a \$5 million trial, in 2013, with 100 unemployed or underemployed Veterans. Veterans were selected randomly from a pool of applicants who ranged in ages from early 20's to early 40's (post 911), who met the Navy's criteria for acceptance into the IT rating, were unemployed or under-employed, and had no technical experience or background. The goal was to place graduates in commercial IT jobs upon completing a 20 week program.

VETERANS SCHOOL COMPLETION & EMPLOYMENT

Out of the 129 students enrolled in the Acuitus Veterans IT school, 3 did not graduate. Two of these students left for recurrent medical reasons; one for a family tragedy. This represents a graduation rate of 98% of all students

The following analyses illustrate the key outcomes of the Acuitus education in terms of employment, salary and performance since job placement. Given that 108 graduates took IT jobs (versus other outcomes indicated below), some of the sub-category conclusions are based on too few data points to be statistically significant. That said, the data tells a compelling story with significant outcomes for these students, along with large effect sizes.

JOB PLACEMENT

The table below shows the post-graduation placement rate into IT careers, as well as the other paths pursued by graduates. Of graduates about whose post-graduation path we have feedback, 95% of those who sought employment obtained a job within 6 months of graduation, with 5% unemployed at six months. 8% of graduates initially went on to further education, and the fate of 5% is unknown.

SUMMARY STATISTICS	Total students		Employed % of Eligible	Employed % All Known		Employed % All Graduates		Employed % All Enrolled
	Initial	Most recent	Most recent	Initial	Most recent	Initial	Most recent	Most recent
Employed (salary data)	108	100	95.2%	90.0%	83.3%	86.4%	80.0%	78.1%
Employed (no salary data)	-	-						
Unemployed	2	5	4.8%	1.7%	4.2%	1.6%	4.0%	3.9%
Eligible for Employment	110	105	100.0%	91.7%	87.5%	88.0%	84.0%	82.0%
Continuing Ed	10	15		8.3%	12.5%	8.0%	12.0%	11.7%
All known graduates	120	120		100.0%	100.0%			
Unknown	5	5				4.0%	4.0%	3.9%
Total graduates	125	125				100.0%	100.0%	97.7%
DNG	3	3						2.3%
Total Enrolled	128	128						100.0%

Average salary (000)	\$ 54.5	\$ 73.4
Median salary (000)	\$ 52.5	\$ 67.5
std. dev salary (000)	\$ 20.9	\$ 23.1

Average and median salaries for graduating students at the time of initial employment were very similar; the salaries aren't dominated by a few very highly paid graduates. Of even greater significance, salaries have increased rapidly, with a Compound Annual Growth Rate (CAGR) of 14%.

Initial base salary was \$54.5K; this was net of insurance, stock grants and bonuses. Initial salary was affected by a number of factors:

- Many employers were skeptical that anyone with 6 months of schooling could qualify for anything more than an entry-level position.
- Many graduates were unemployed, had no financial reserves, and had families to support; they often took the first job offered to them, even if it was an entry-level position.
- Graduates often took jobs where they felt the challenge would be modest, not yet confident in their abilities.

The school was designed to educate Veterans to the level of a senior level systems or network engineer, with five to ten years of experience; they were educated to a much higher level of competence than many of the job offers reflected. Subsequently, for most of the graduates, their abilities were recognized in their subsequent performance reviews, or the graduates changed jobs as their confidence in their abilities matured. Thus, three years later, the average salary had increased to \$73.4K, a CAGR of 14% that is significantly above the industry average of 5.1%.

Additionally, only three individuals who were employed within six months of graduation have become unemployed since initial employment. Five returned to school, to continue their education after initially taking a job.

SALARY INFORMATION

The table below shows salary data for all reporting graduates who took up jobs within six months of graduation. Two major observations are important: (i) all of the starting salary metrics suggest substantial premiums over typical earnings of these students prior to the school. In most cases, these

students were either unemployed or had hourly wages that hovered around minimum wage; (ii) the increase in income since the initial job placement has been significant, averaging 14% per annum, across all bands below. This reflects well on the quality of the career preparation received by students attending the school - they are educated well beyond the requirements of their initial jobs. It also bodes well for the graduates' ability to maintain employment.

Year of Graduation	Initially Employed	Initial Average Salary (\$000)	Currently Employed	Current Average Salary (\$000)	Salary CAGR %
2013	80	\$ 52.9	73	\$ 74.8	14.5%
2014	15	\$ 61.8	14	\$ 75.4	13.2%
2015	13	\$ 56.0	13	\$ 63.3	13.1%
All employed students	108	\$ 54.5	100	\$ 73.4	14.6%

Note: Most recent survey of salary bands was conducted in H2, 2015

Drilling down in more detail, the table below shows the distribution of all initial job placements by salary band. At graduation, only 22% of students received job offers for less than \$40k, and 85% of those have subsequently jumped to a higher band. At the other end of the spectrum, 11% of graduates received offers for \$70k or more, and in the latest survey that had increased to 48%¹.

SALARY DISTRIBUTION CURVE	Initial		Most Recent	
	#	%	#	%
Less than \$40,000	24	22%	4	4%
\$40-49,999	25	23%	9	9%
\$50-59,999	26	24%	18	18%
\$60-69,999	21	19%	21	21%
\$70-79,999	3	3%	15	15%
\$80,000 and above	9	8%	33	33%
Number reporting	108	100%	100	100%

TIME TO EMPLOYMENT

The table below shows the number of days between graduation and job placement for those that obtained employment. As indicated, almost half of students had jobs at graduation; of note, the infrastructure to support job placement was created in parallel with running the first cycle of the school. There was not an established pool of available jobs nor were there large commitments to hire from a

¹ The maximum time between initial job placement and the last survey was 2.75 years. The majority of students graduated in the second half of 2013 and 2014.

few select companies. Students had primary responsibility for obtaining employment, initially finding jobs among 40 companies in 15 states².

TIMING OF EMPLOYMENT	Number	%
At graduation	49	45%
30 days	17	16%
60 days	14	13%
90 days	11	10%
120 days	7	6%
150 days	1	1%
180 days	1	1%
>	8	7%
Total data set	108	100%
AVERAGE DAYS TO EMPLOYMENT		
	46	

Very few post-secondary educational institutions and none targeting the demographic addressed by Acuitus, can demonstrate this short an average period between graduation and placement.

SALARY INCREASES

Looking at the distribution of salary increases, for students who have been employed for longer than two years only 10 have received annual increases of 5% or less. The vast majority of graduates are receiving annual increases well above 5% and over 50% have received annual increases of at least 10%. Acuitus graduates have increased salaries at almost three times the rate of IT workers as a whole.

SALARY INCREASE DISTRIBUTION		Time from Graduation (Yrs)			Total Base Reporting 2015	
		2+	1 to 2	0 to 1	Number	%
Average	0%	10	10	2	22	22%
Annual	1-5%	8	1	0	9	9%
Salary	5-10%	13	3	0	16	16%
Increase	10-15%	7	2	0	9	9%
since	15-20%	5	2	0	7	7%
Graduation	>20%	24	8	5	37	37%
Total reporting 2015		67	26	7	100	100%
Sources for data below						
Average for all Acuitus graduates		14.6%			Acuitus data	
Average basket of IT jobs		5.1%			Robert Half	
Average for all employees 2013-2015		2.9%			Mercer	
Average highest performers (7% of WF)		5.0%			Mercer	

More than sixty-percent of graduates (and over eighty- percent of those who had been employed for at least one year) received at least one promotion since joining the IT workforce.

² Acuitus did provide extensive support in converting military resumes to civilian culture and preparing students to be able to perform well in an interview, talking about technology and conveying their knowledge and experience.

PERFORMANCE BY EDUCATION LEVEL

In terms of previous educational attainment, four groups of students have completed the Acuitus School: high school graduates, some college, Associate’s degree and Bachelor’s degree. There is insufficient data per group to draw formally reliable conclusions, because of the limited number of data points in the sub-groups, but observationally we can see that while those with only a HS diploma or GED started at lower average and median salaries than other graduates, they appear to have done extremely well in the work place and have the highest rate of growth in income. As a consequence, they have almost caught up with the other groups.

Educational Attainment	Number	%	Average Initial Salary	Median Initial Salary	Average Current Salary	Median Current Salary	Average Salary CAGR%
High School	23	21%	\$ 45.7	\$ 42.5	\$ 64.5	\$ 67.5	17.4%
College, DNG	20	19%	\$ 54.4	\$ 52.5	\$ 75.9	\$ 72.5	18.0%
Associate’s degree	21	19%	\$ 52.0	\$ 52.5	\$ 72.0	\$ 65.0	15.0%
Bachelor’s degree	44	41%	\$ 60.5	\$ 52.5	\$ 77.4	\$ 72.5	11.8%
Total class	108	100%	\$ 54.5	\$ 52.5	\$ 73.4	\$ 67.5	14.6%

PERFORMANCE BY AGE GROUP

Caveats about sample size and variance notwithstanding, the age group analysis is also directionally interesting. Starting salaries were only noticeably higher for the oldest group, while the youngest group of students generally held their own. The youngest group has had the highest growth in salary since joining the workforce, while the 27-30 group now has the highest average salary.

Age Range	Number	%	Initial Average Salary	Current Average Salary	Average Salary CAGR %
26 or less	22	20%	\$ 51.7	\$ 75.0	17.5%
27-30	42	39%	\$ 54.8	\$ 77.1	16.2%
31-34	22	20%	\$ 54.3	\$ 69.8	12.8%
Greater than 34	22	20%	\$ 57.0	\$ 68.0	9.3%
Total class	108	100%	\$ 54.5	\$ 73.4	14.6%

Note: Exact age ranges chosen to provide similar number of data points per group

JOB DIVERSITY

The Acuitus education focuses on teaching concepts and understanding that should provide a fundamental grounding in IT that can be applied across a wide range of IT-related jobs and career paths. The table below summarizes the number of different *initial* job positions taken up by graduates at initial and subsequent employers. There are, broadly speaking, ten IT related job “clusters” covering almost fifty discrete job positions (a cluster is a collection of titles with similar work duties and responsibilities).

Most Junior Positions				Most Senior Positions			
Job Title	Job Cluster	Job Title	Job Cluster	Job Title	Job Cluster	Job Title	Job Cluster
Customer Service	1	App Support	2	Assoc Con Egr	5	Sr Net/Sys Admin	6
EU Support	1	Apps Engineer	2	Assoc SW Engineer	5	Data Ctr Tech	6
Field Engineer	1	Cyber analyst	2	SW dev trainee	5	IT Ops	7
Field Tech	1	Tech consultant	3	Computer Systems Engineer	5	SW Analyst	8
Help desk admin	1	IT specialist	3	IT Engineer II	5	BI Analyst	8
IT Support Tech	1	Admin Support Controller	3	ITSpecialist	5	IT Instructor	9
IT Technician	1	Junior S&N A	3	Network Engineer	5	IT Director	10
Junior IT Tech	1	Net Admin	4	NOC Technician	5		
Junior Tech	1	System Admin	4	Senior Tech	5		
Net support	1	System&Network Technician	4	Senior Support Egr	5		
Net technician	1	Tech Support L2	4	T2 Engineer Support	5		
Service desk tech	1	Tier II Technician	4				
Support Engineer	1						
Tech support rep	1						
Web Filter Tech Support	1						
Wireless Tech	1						
QA	1						

Note 1 Job clusters indicate finer-grained job title rankings
Source: Alumni survey 09/16

ACUITUS COMPARED TO OTHER EDUCATIONAL PATHS

The table below compares Acuitus graduate's initial salaries, by age range, for those graduates employed in California, against average salaries of other educational paths in California. While the results are statistically limited, especially for 25 years and younger, they do indicate a significant "effect size" – namely, Acuitus graduates receive substantial premiums versus earnings attainment for other paths an Acuitus graduate might have taken³.

Age and Average Salary Benchmarks for CA			
	<=25	26-30	>30
Bachelor's	\$ 45.0	\$ 53.0	\$ 66.0
Associates	\$ 36.0	\$ 40.0	\$ 46.0
Some college	\$ 32.0	\$ 35.0	\$ 41.0
High school	\$ 30.0	\$ 32.0	\$ 35.0
Acuitus (starting salary)	\$ 56.9	\$ 56.9	\$ 61.4
Acuitus v Bach.	1.27	1.07	0.93
Acuitus v AA	1.58	1.42	1.34
Acuitus v Some coll	1.78	1.63	1.50
Acuitus v HS	1.90	1.78	1.76

Note: N=9, 26, 36 for the three categories; CA initial salaries slightly higher than national average

³ It should be noted that the choices facing potential Acuitus students are an IT career after Acuitus versus some other kind of job without Acuitus, so a general comparison is meaningful in this case.

SUMMARY

A number of conclusions are significant:

- The cohort was comprised of unemployed or underemployed Veterans with no relevant technical background;
- 98% graduated on-time, in five months; three did not complete for medical or similar reasons;
- Over 90% were employed in their field of study within six months;
- Prior education level was not a predictor of employment; education level was a predictor of initial salary, but not of compensation growth once employed.
- Fewer than 3% of employed graduates were unemployed after 2 ½ years.
- The overwhelming majority of graduates ended up in IT careers where they remain to this day, typically in jobs evolving quickly, requiring conceptual understanding, learning skills and critical thinking.
- The rate of growth in compensation significantly exceeds the average for all IT workers (by almost a factor of three), supporting anecdotal feedback about career progression and graduates ability to switch jobs to accelerate growth in earnings and responsibility.

The unique advantages of an Acuitus education for students are: guarantee of graduation; guarantee of meaningful IT career path post-graduation; very rapid graduation and entry into the workforce; attractive day-one salary and rapid salary and career advancement once placed. All these advantages come about because of the unique combination of technology, pedagogy and support of the students for job placement that is built into the Acuitus program.

RETURN ON INVESTMENT (ROI)

All these significant benefits translate into an ROI for an Acuitus education that is extremely high, with a lifetime NPV advantage between \$750,000 and \$1 million. Such a substantial lifetime income benefit, multiplied across hundreds of thousands of students per year, would transform overall economic growth potential by dramatically improving outcomes for the most disadvantaged groups of young people in this country versus incrementally improving prospects for college-bound students. It is why this project is so critical, as it validates an educational platform that would be able to transform STEM education, dramatically change career options for young people who would otherwise face a future with poor employment prospects due to automation or outsourcing, and provide this large group with a transformational educational experience that would improve their ability to understand complex political and economic trade-offs, and participate more effectively as citizens of an advanced democracy with a more critical assessment of the world.

APPENDIX: INDEPENDENT EVALUATION OF NAVY TUTOR EFFECTIVENESS

The validation of the effectiveness of the Acuitus tutor was demonstrated in several studies undertaken by the Institute of Defense Analytics (“IDA”) in 2014, in which the performance of the incoming Navy students educated by Acuitus was compared in a series of trials and competitions spanning multiple days both against the performance of oncoming students who had been trained in the Navy’s traditional IT program and against the performance of experienced Fleet ITs with multiple years of experience. The results were clear, statistically significant and reflected a very large effect size.

The following extract is taken from the diligence report prepared for the Department of Defense by the Institute of Defense Analyses:

Accelerating Development of Expertise: A Digital Tutor for Navy Technical Training by JD Fletcher and John E. Morrison, November 2014. IDA Document D-5358 Log: H 14-001221/1

“Five major formative assessments were performed during the Digital Tutor’s development. The fifth assessment, designated IWAR 2, was the capstone assessment for the DARPA program. It provided summative evaluation of the first complete 16-week version of the Digital Tutor. Three groups of learners were included in the assessment:

- 12 graduates of the 16-week Digital Tutor.
- 12 graduates of a 35-week classroom lecture and laboratory-oriented Information Technology Training Continuum (ITTC) course.
- 12 senior ITs averaging 9.6 years of experience in the Fleet who were selected for their superior levels of IT performance and competency.

In addition to 4 hours of knowledge testing, IWAR 2 consisted of three types of practical exercises:

- Troubleshooting by six three-member Digital Tutor, Fleet, and ITTC teams over a period of 2-1/2 days.
- A Security exercise performed by the same teams for about 4 hours.
- A System Design and Development exercise conducted for 6 hours by all six members of each group (Digital Tutor, Fleet, and ITTC) for the week participating in self-organized teams.

Overall results of IWAR 2 testing are shown below. At least three patterns were repeated across the different performance measures:

- With the exception of the Security exercise, Digital Tutor participants outperformed the Fleet and ITTC participants on all other tests.⁴
- Differences between Fleet and ITTC participants were generally smaller and neither consistently positive nor negative.

⁴ There was no Security content included in the Digital Tutor; the graduates should not have been expected to do above the norm in this competition.

- On the Troubleshooting exercises, which closely resemble Navy duty station work, Digital Tutor teams substantially outscored Fleet ITs and ITTC graduates, with higher scores at every difficulty level, less harm to the system, and fewer unnecessary steps.

Performance Measure	Direction of Effect	Significance	Effect Size	Goal
Acuitus (DT) versus Fleet Experts (FE)				
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Source: Institute for Defense Analytics: Accelerating Development of Expertise: A Digital Tutor for Navy Technical Training, IDA Document D-5358 Log: H 14-001221/1

Effect size above is measured as:(Average score of A-Average score of B)/Standard Deviation of A

Overall, if Digital Tutor graduates had matched Fleet IT performance in the practical exercises, the goals of the program to accelerate acquisition of expertise would have been met. Instead, the Digital Tutor students outscored Fleet participants with years of on-job training by substantial margins in performing job-sample practical exercises. It is also notable that the Digital Tutor graduates substantively outscored ITTC graduates who had spent more than twice the time in training.

Three ancillary issues were examined. The training provided by the Digital Tutor produced higher overall scores in knowledge testing than did human tutoring, with an effect size of 0.61. The difference was not statistically significant compared to human tutoring, but it leaves open the possibility that Digital Tutoring may be superior to human tutoring even when it attempts to clone human tutoring. The issue deserves further examination. Gini coefficients were used to assess the fairness or equality of learning provided to learners across the spectrum. They found that the learning provided by Digital Tutoring is more equitably distributed than that provided by classroom and laboratory instruction. Finally, reading ability as measured by a standard test of reading vocabulary and reading comprehension was found to account for effectively none of the variance in IT knowledge among Tutor graduates, but about 25 percent of the variance among the classroom graduates. In summary, it seems reasonable to conclude that development of expertise can be substantially compressed and accelerated in technical training, that this capability is of considerable monetary and operational value, and that it should be vigorously pursued.”

The practical manifestation of this dominance of the DT students over both ITTC students and Fleet experts is shown in relative performance of each group on a stern test – trying to solve trouble tickets from the Navy’s repository of more than 20k tickets, many of which had previously only been resolved

by “gurus” with well above the level of expertise of the Navy’s own Fleet Experts. As indicated in Section 1 of this document, the DT students were able to resolve a substantially higher percentage of such TTs than the other groups, and that their dominance over the other groups increased significantly the harder the problems got. It also shows that the DT students attempted between 30-100% more problems than the other groups while still achieving a much higher solve ratio. These were compelling results with a high degree of statistical significance, as indicated above.