

Sperry Univac Pioneers Application of Artificial Intelligence – 1985-1987

By: Larry Walker, May 2023

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The first meeting was convened in 1985 by Gerry Probst, Chairman of Sperry. He opened the meeting with these remarks:

“Gentlemen, Univac missed the mini-computer. Then we missed the personal computer. I have been hearing a great deal about this new artificial intelligence technology. I want to know if this will be ‘the next big thing’”

He proceeded to set up a task force to investigate this possibility. Larry Walker was selected to lead this task force.

Larry had over 15 years experience with Sperry Univac,¹ spanning airline reservations systems, operating systems, system design, and strategic planning. He had NO knowledge about artificial intelligence and learned subsequently, no one else in Sperry did either. The task force had people to cover technology, business operations, legal, and finance. It also had permission to request any assistance needed as the team moved forward.

The task force began by visiting MIT and Stanford, two of the three leading universities involved with artificial intelligence research (Carnegie Mellon University was the third one).

The MIT visit led them to Texas Instruments which was in the final stages of delivering a Lisp-based computer hardware system. Since 1957, Lisp had been the major artificial intelligence research tool. Texas Instruments welcomed the Univac visit, as computers were a whole new line of business for them while Univac had been one of the industry’s founders.

¹ (Sperry) UNIVAC (see [Wikipedia article](#))

The Stanford visit led to IntelliCorp which was a company spun off from the work done at Stanford. IntelliCorp used KEE (Knowledge Engineering Environment) which was a Lisp-based development system for expert systems. As a relatively new start-up IntelliCorp also welcomed the Univac visit and freely shared information related to the work they were doing.

Stanford, under the leadership of Dr. Ed Feigenbaum², had pioneered the idea of creating AI software based expert systems – capturing the knowledge know-how of experts in a form that could guide novices through expert processes. IntelliCorp³ was continuing this work with KEE as their operating system foundation.⁴

In order to sample the power of this new AI environment, Univac sent one programmer to attend a 3-day workshop organized and delivered. When the programmer returned, Larry met with him to determine what had been learned.

The programmer explained as follows:

“I used their new tool set and began to apply it to a programming problem that I had in mind. At the end of the 3-day workshop, I had, indeed, programmed the solution to my problem. This indicated that their tool set was reasonably quick to learn – a good start.

After reflecting on the three days, however, I realized that I had done only one thing new – I had used a new tool. That was not unusual for me and certainly was not revolutionary. Wondering if I had missed something I went to the company leadership and explained what I had done – and – I asked them ‘what am I missing?’

They organized a debriefing session with one of their graduate students who proceeded over the next two hours to show me a completely new approach to problem solving – one far more insightful

² Edward Feigenbaum (see [Wikipedia article](#))

³ IntelliCorp (see [Wikipedia article](#))

⁴ MYCIN - bacteria identifier → EMYCIN (generalized rules) → KEE (see [Wikipedia article](#))

than my more conventional approach. This convinced me that what they had was powerful.”

Larry was strongly impacted by this report. The programmer he had sent had over 25 years of serious programming experience and was one of the best programmers he had ever worked with. For this person to be ‘schooled’ by a young graduate student was impressive. Larry was convinced that this technology was powerful and well could represent a new line of business to replace Univac’s declining mainframe business. After 6 months of investigation and 3 days of hands-on experience, he was ready to make a recommendation.

Artificial Intelligence had NO history as a successful business opportunity. However, Univac desperately needed a meaningful new line of business. How to present this opportunity?

Larry made the following presentation to Mr. Probst and his key staff: “I recommend that Sperry Univac initiate a major program in artificial intelligence. There are three major reasons for doing so:

1. Univac is a problem solving company. AI tools are the most powerful problem solving tools we have seen. In the programming world there are about 1200 programming languages, yet all of them follow the same procedural problem-solving method. AI has three new programming languages, each of which introduces a new problem solving methodology: Lisp - a functional language, Prolog - a predicate logic language, and Smalltalk - an object-oriented language – three new problem solving methodologies!
2. The ability to solve problems is constrained by the ability of the tools you have to use to represent those problems. The AI knowledge representation tools are the most powerful we have seen.
3. Up until now, computers have only done what its users tell them to do. These instructions on what to do are often complex in format, yet the computer environment allows NO deviation from the proper format. Errors are inevitable. ***In the AI world, however, the roles***

of the computer and the human are reversed. In the AI world, the computer leads the user. This is revolutionary.”

Hungry for a new line of business, this recommendation was accepted by the Chairman and his staff. Mr. Probst then directed Larry to deliver the plan that would launch a meaningful entry into the application of AI world. His directions indicated there were no boundaries on what could be proposed - no funding limits, no organizational limits.

Larry, who had previously been part of a successful 5-year program to develop a real-time operating system for Univac, proceeded to write this Program Plan. The operating system had met all its milestones and criteria and had gained two major customers, the telephone company of Spain and the internal airline of Japan. However, despite its success, the program was ultimately canceled due to the false claims made by the VP of the company's major operating system. The VP had lied and said that his product could do the same in three years, leading to the cancellation of Larry's project. From this experience, ***Larry learned that the "newbie" could never beat the "oldie" who had all the company's customers.***

With this experience behind him, Larry decided forming a new AI Division was out – it would never withstand the opposition from the existing divisions all of whom may lose funding to this new Division. ***He settled upon a 'technology infusion strategy' which would focus on infusing AI into all the other divisions and eliminate the threat of competing for funds.*** The AI Program was built around this strategy.

The AI Program Plan was created: a \$250 million plan growing steadily in size over a 5-year period. This Plan was presented to the Chairman and the Presidents of all the Univac Divisions. It was accepted without challenge.

At the center of the Program would be the KSC (Knowledge Systems Center), a relatively small group of AI missionaries whose job would be to convince all the parts of Univac to participate in the AI Program. The KSC

had 16 members, drawn from the various divisions of the company, each well-connected and respected by their peers in that division. The KSC also had a pool of ‘discretionary’ funds which it would use to fund initial pilot AI projects in each of the divisions – so the divisions did not have to divert any of their committed funding to something new that they knew little about.

Artificial intelligence at this time comprised 5 major fields of research: robotics, voice recognition, vision recognition, machine learning, and expert systems.⁵ Robotics was making progress, Univac, however, was not a pure manufacturing company. Voice recognition was making modest progress but applications for its use were limited. Vision recognition was 10-20 years away. Machine learning was in its early stages (and Big Data was not on the horizon at this time). Expert systems had shown practical results and were an excellent fit to Univac’s problem solving capabilities, so they became the focus for the AI program. Application of the tools that existed was the aim of the program, not research.

An OEM agreement was put in place with Texas Instruments, so Univac could sell their AI-based hardware. A licensing agreement was reached with IntelliCorp for \$4 million, so Univac would sell their KEE operating system running on the TI hardware – so product was quickly in place.^{6,7,8}

The KSC staff then began the search for suitable AI pilot projects in each of the Divisions. This went very well (thanks to KSC providing the pilot project funding). Soon Univac was working on: intelligent contracts with its legal staff, intelligent facility moves with its facilities staff, intelligent data bases with its software groups, threat assessment solutions with its defense department groups, etc. etc. These pilots were the training ground for Univac programmers to use the new hardware and software environment plus the three new programming languages.

⁵ History of artificial intelligence (see [Wikipedia article](#))

⁶ Texas Instruments Explorer II (see [Techmonitor press release](#))

⁷ Association for Computing Machinery (see [Lisp hardware architecture: the Explorer II and beyond](#))

⁸ TI Explorer Family (see [A mostly LISP weblog](#))

The KSC encouraged use of all three of the major AI programming languages: LISP, Prolog, and Smalltalk. While all three were used, LISP became the favorite, and the object-oriented aspects of Smalltalk became foundational across the computer industry.

An initiative to collaborate with universities was also begun. Univac offered a free AI hardware and software product, so they could put their students to work in the AI field. The intent of this was to train Univac employees of the future.

Global marketing loved the new line of business, and Univac quickly had customers onboard around the world.

Over the first two years of the AI Program, the progress was impressive:

- A hardware and software product line was in place.
- Over 100 pilot projects were underway.
- 350 programmers were quickly being trained on these pilots.
- Many of the projects were quickly finished as the tools were powerful.
- 50 customer projects were underway.
- 43 universities around the world were using our AI products with students.

Then in late 1987 Burroughs⁹ bought Sperry Univac – and – **terminated** all discretionary spending in which they lumped the AI Program – with minimal attempts to understand what it was about.

Reflection

Thinking back on the tragedy of that short-sighted decision is painful, even 30+ years later. Univac as a \$5 billion problem solving powerhouse would have demonstrated considerable success with these AI tools. Our large cadre of programmers had shown time and time again that they could quickly master new programming tools – and they were well on their way with these new AI tools.

⁹ Burroughs Corporation (see [Wikipedia article](#))

The KSC team could 'see the future': intelligent contracts, intelligent office moves, intelligent data bases, intelligent military solutions, and on and on. Metamorphosis was the term being used to describe this future, and there was certainty that it was in hand. Later the same programmer who attended the IntelliCorp workshop and who had implemented a half dozen expert systems indicated that he did NOT want to do any more – because if the expert had real expertise, he knew that he could capture it on the computer and lead less expert users through expert processes. Expert system solutions became routine.

PEAKSolutions, Inc. was started by members of the KSC and in 5 years of business delivered 39 of 40 customer expert system solutions. When the team was challenged with literature flooding the AI world in about 1990 that claimed it was 'impossible' to extract tacit knowledge from the experts, they simply disagreed, stating, "We do NOT have that problem." PEAKS coined the term 'Reflective Knowledge Engineering' to capture the essence of the process they used. Unfortunately, most other AI companies did fail to extract tacit knowledge from experts, and 'AI Winter' set in in the early 90's. Even PEAKS' demonstrated success could not overcome the public's mistrust of AI, and the company went bankrupt.

Larry continued the pursuit of AI solutions, founding a second company, KMI (Knowledge Management, Inc.). Knowledge Management was the latest arm of the full AI world, and in 1993, KMI developed a Knowledge Engine that worked entirely at the Knowledge level where knowledge objects were stored in a true knowledge base with associated attributes as to why anyone may want to see that object in the future. This powerful engine was successful, until the arrival of the Internet in the mid-90s which took over the public's mind space, and the Knowledge Engine could not operate at the Internet's html level – that environment could not handle Lisp at the time.¹⁰

¹⁰ On Building a Cloud and Choosing Lisp (See [Oracle - Mase Graye](#))

Since those early years, the broad horizon of AI has matured dramatically. Robotics is a powerhouse technology sweeping through the manufacturing industry. Voice recognition is robust, and vision recognition finally broke through and is fueling multiple applications. ML (Machine Learning), riding on the back of Big Data, has become the focus of much of the industry today – with less attention being paid to expert systems. Some of the expert systems people wonder if ML is a solid basis to build on, as the experts in the field seem to have NO idea why the ML process reaches the conclusions that it does. This failing will have to be addressed before the technology can be put into operationally complex processes.

Continuation

The approach of using the methodology of knowledge base development has continued since the times described above. An example is KBE (Knowledge Based Engineering) which has gone through several phases in support of engineers as they design and produce processes and products. An associated article provides an introduction to the KBE methodology.