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Siemens Power Corporation: Surviving R/3

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Several months before SPC¹'s executive committee made its final decision concerning the adoption of R/3, the information systems management team stood up and urged them to transform it into a user-led initiative.

One of the recommendations that we made to the executive committee before they gave their final approval was that we thought that it should be headed by a user project leader because I think it is important that it is not run out of IS. – C. M., IS manager, January 1997

This triggered a search for the right individual – an individual that executives could trust to pull off the effort. It did not take long until two suitable candidates were identified. Both candidates were well known throughout the company, had extensive business expertise, and a considerable tenure with the firm. Top management finally chose G. R., SPC's purchasing manager, because he was also a veteran of an earlier software implementation. That package was now to be replaced and knowledge about its functionality and set up could prove valuable during the R/3 project.

When G. R. was named R/3 project manager in June 1995, he knew that he was about to embark on the most challenging project of his entire career. From top management down to shipping clerks, everybody was counting on him and he certainly did not want to let them down. He just hoped that he would be able to count on others in the same way that they would be able to count on him.

It is not in my psyche or chemistry that we can fail. I think the only thing that can fail us is that management gets so hung up in politics that they will wind up not wanting to make any changes or alternatively that they want to make substantial changes that affect all of the benefits of SAP. Anyone reading the literature on ERP will understand you just can't do that. If you don't, then you really should not have those kinds of problems. And then, how could you not succeed? – G. R., project manager

Background

¹ SPC is the acronym of Siemens Power Corporation

Siemens Power Corporation is a globally operating manufacturer of both fossil fuel and nuclear power generation systems. It is wholly owned by its German parent Siemens AG. Siemens Power Corporation's Richland, WA, based nuclear fuel fabrication plant (hereafter referred to as SPC) engages in the manufacturing of nuclear fuel assemblies for both BWR and PWR reactors² and related services. The plant was originally founded as Exxon Nuclear in 1969 and later bought by Siemens AG. While its German sister plant serves the European markets, SPC primarily competes in the US. With a market share of approximately 20%, SPC is the third largest competitor after Westinghouse and GE, which command 35% and 25% of the market, respectively. The remaining 20% of the market is about evenly divided between ABB/CE and Framatome/Cogema. Before restructuring its operations (see below) SPC had about 960 employees and revenues of \$200-300m.

After a promising start in the early 1970s, the prospects of the nuclear fuel industry soon dimmed. The public's call for safer and cheaper energy sources in the second half of the 1970s led the industry's main customers – US based utilities - to sharply reduce their involvement in nuclear power. In addition, a nation-wide decrease in energy consumption intensified competition.

The impact for the nuclear fuels industry was disastrous: At the beginning of the 1990s, SPC found itself competing against its four US rivals in a non-growing market operating at half capacity.

SPC's business situation

While all of its competitors specialize in the manufacturing of either BWR or PWR fuels, SPC manufactures both. As a result, SPC's costs and prices have always been higher than the competition's. Thanks to its reputation as a supplier of high quality fuel, SPC nevertheless managed to compete effectively. However, over time the distinction in quality between the competitors diminished. It soon became clear that SPC was not able to survive much longer if it continued business as usual.

In 1994, Siemens AG decided to send in a McKinsey team to help restructure (reengineer) SPC's operations. McKinsey suggested a two-pronged approach that aimed at both improving SPC's productivity and extending its technical lead. In collaboration with SPC, the consultants developed close to 600 restructuring measures for simultaneous improvements in cycle time, quality, and productivity. The measures cut across all functions and departments of SPC. Their implementation was scheduled to start in early 1995 and to end in September 1997. As a result of this effort, SPC's headcount was expected to be reduced by about 30%, down to 680.

SPC's computer information systems department (CIS) was among the first to complete the McKinsey guided action planning process. Its most important outcome was the idea to get rid of SPC's costly IBM 4381 mainframe-centric IS infrastructure. Aside from annual savings of about \$800,000 in OS licensing/maintenance fees, the removal of the IBM also promised to address some concerns related to SPC's aging legacy systems currently running on the mainframe; for example: the "Y2K problem" and the high costs associated with maintaining the multiple interfaces linking SPC's array of custom-built legacy systems.

² Boiling water and pressurized water reactors

Overall, a replacement of the IBM with a client-server environment and an overhaul of SPC's IS portfolio promised annual savings of about \$1.4 million. SPC assigned a budget of \$4million to the project which made it the largest single effort within the entire restructuring effort.

Choosing a package

CIS knew that developing a new system from scratch was not an option. While the department had been involved in the past in implementing and maintaining large business packages such as its MRP II software (AMAPS), it had never developed any of these programs from scratch. This left it with the question of what software package to pick. More than a decade ago, Siemen AG had bought a significant number of SAP licenses. Siemens' subsidiaries could purchase these licenses through Siemen Nixdorf (SNI) – a consulting company at a significant discount. This and the fact that it was/is corporate policy “to go with SAP” made SAP's R/3 SPC's system of choice. However, despite this obvious predisposition towards the package, CIS conducted an analysis to assess the fit and features of the SAP R/3 software before recommending the package to SPC's top management.

Looking for consulting help to both evaluate and eventually implement the package, CI requested bids (March 1995) from SNI, IBM, and HP. CIS chose SNI because of its track record, methodology and its association with Siemens. In summer 1995, CIS and SNI started a 3-months-project in which they determined the overall fit of R/3 with SPC's operations. SPC learned that R/3 was a powerful package, if not exactly the silver bullet they had hoped for. SNI's overall assessment read as follows.

According to the answers given by Siemens Power Corporation, the available functionality matches the requirements of SPC to a level of 100% in the controlling (CO) and financial accounting modules (FI). Materials management (MM) has a 90% fit. Production planning (PP) has a 70% fit. There are no requirements in sales and distribution (SD). In the remainder of the R/3 modules there are some exceptions. All the noted exceptions can be resolved with either re-engineering or enhancements to SAP. excerpt from: SNI's report on the IA performed at Siemens Power)

SNI also sketched out a detailed plan for how to go about the implementation project, recommending the “Big Bang” approach to save as much money as possible. In September 1995, SPC's top management made the final decision to go with SAP R/3. While SPC rejected the Big Bang as too risky, they nevertheless hired SNI for the project. Finally, only one major decision remained to be made before the implementation could start: The hardware – What to buy? And from which vendor? Again, SPC chose to buy from a Siemens company. This decision was, however, controversial since the vendor was a relatively new player in the market without well-established customer support in place.³

Establishing the project context

Initial Project Scope

³ For a detailed account of the R/3 adoption process at Siemens Power, is referred to Hirt and Swanson (1999)

Although SPC chose to buy the “regular” SAP R/3 package⁴, they did not intend to implement all modules. They chose FI, CO, AR, AP, MM (including “EM”), PP, PM, QM⁵. By contrast, they did not see any need for R/3’s sales and distribution modules, nor did SPC plan to implement R/3’s highly complex human resources (HR) module. The HR module was excluded from the implementation effort since there was no perceived need in insourcing functionality that was presently satisfactorily dealt with by an outsourcer (see Figure 4). Furthermore, many other US-Siemens companies used the same outsourcer – thus the present solution appeared to be cheaper, more convenient, and sufficiently reliable.

Due to limitations in R/3’s functionality some legacy systems were to be kept outside. One was Siemens’s proprietary production scheduling system “Leitstand”. Leitstand offers highly sophisticated graphic capabilities which are unmatched by R/3. Moreover, Leitstand is a stand-alone PC-based solution; thus, mapping its functionality into R/3 would not have brought SPC any closer to its original restructuring goal of reducing costs by “getting rid of the IBM mainframe”.

By the time SPC started with the R/3 implementation, the company had already accomplished a lot of the re-engineering related changes originally proposed during the McKinsey-led restructuring effort. SPC’s management was, however, aware of the fact that additional “fine-tuning” of the company’s business processes was still a possibility. It appeared, however, that despite good intentions realization of this potential was left more to chance than focused determination:

I would like us to reengineer as much as possible. I think we have done a great deal of reengineering. However, it is up to the areas to do their reengineering. As a project manager it’s hard for me to go in, and say, you haven’t done enough reengineering because I have two opposing commitments: to reengineer and to meet the [implementation] deadline. I can only do so much before I have to let the deadline slip. We can always go back and can make the other improvements that we may have given up on. The main ideas that are related to restructuring though, I am not giving up on! I would not allow anything to keep us from these objectives! – G. R., January 1997 14:86

Overall 216 R/3 user licenses were purchased prior to implementation. Each department involved was asked to put in their estimate as to how many licenses they may wind up using. The overall cost of these licenses amounted to a total of \$353,000 which comes down to an average of \$1630 per license.

Top management approved \$4 million for the project. \$1 additional million was earmarked for emergency purposes. For an itemized breakdown of the budget see Figure 1 (appendix)

Project Organization and Management

⁴ as opposed to an “industry solution” that is tailored to the needs of a particular industry (cf. www.sap.com)

⁵ Finance, Controlling, Accounts Receivable, Accounts Payable, Materials Management, Essential Materials, Production Planning, Plant Maintenance, Quality Management

SPC's top management team put a number of committees/teams in place to guide, manage, and execute the project: the executive committee, the steering committee, a project manager, and a project team.

The executive committee was comprised of members of SPC top management team. Its main focus was not the R/3 project per se but consisted of monitoring the overall restructuring effort. Concerning R/3, they saw their role as executive sponsors and facilitators.

I think our role is to provide the resources, I mean to name the team to relieve them from their day-to-day responsibilities and give them full-time responsibility on the project. Some people are fulltime. But in addition we identified others to complete the core team. We said you are now on this project 50% of your time and we will preserve that regardless of anything short of the plant burning to the ground. Another aspect of our role is providing the necessary funding. But there are some controls in place. For example, we want to make sure that we are not grossly overspending the budget and so they have to come to us to justify additional funding. In addition we need to monitor, whether they maintain the schedule. It is pretty critical that we have this all done and in place this fiscal year so that we can reap the benefits as part of restructuring for next year. – V. M., top management (1/97)

The committee convened about four times a year. They invited G. R. to each of these meetings to report on the progress of the R/3 implementation. This way, top management hoped to stay informed. At the same time, they also hoped to communicate the importance they attached to the project as key to success of the restructuring effort. G. R. deliberately kept his presentations at a fairly general level and tried to limit them to about ten minutes. Usually, only a few general questions were asked. Other than that, top management gave G. R. considerable freedom. They did not intend, nor did they have the time, to micromanage the project.

G. R. was given a lot of freedom. We asked him to think of people he would like to have on his (project) team because we did not just want to say, you get this person, this person, and this person. Instead we wanted to make sure that there was nobody with who he would have a personality conflict. So he had input to the team members and then the management team agreed to those as I recall. – V. M.

The project team was divided into six sub-teams, each of which had responsibility for the implementation of a particular module or group of modules. Team members were drawn from the departments ("organizations") that implemented R/3. With 20%-30% of its workforce having been laid off SPC was, however, short of staff. Therefore, only a handful of employees could be assigned fulltime to the implementation effort. An SNI consultant commented on the situation:

Our hardest problem has been getting resources freed up internally [SPC] to dedicate the time. G. R. got some fulltime, 100% dedicated resources to the project. Those resources we relocated to a common area. What we have a problem with, however, is when we need large portions of other individuals. For example, when we need 50% or 80% of that person's time. Because they have not relocated, they are always down in their own individual work areas. There they are involved in their everyday work, and as a result you never get the time you have been counting on. So it is almost better to "isolate" them; i.e. to bring them into a separate project area and when they want to leave for 25% of the time to go back to their other job, yes, that's fine. This way they stay more involved and don't get side-tracked. – M. O., SNI consultant, January 1997

G. R. doubled as project manager and fulltime MM sub-team member because of his knowledge in the purchasing area. All remaining project team members were supposed to dedicate as much time on SAP as they could afford aside of their normal jobs (see Table 1) G. R.'s main selection criterion for selecting project members was their respective business expertise. However, he also took into consideration computer literacy, age, and stamina. Except for one or two of his favored candidates, top management agreed to all his choices. In those

cases where his first choice was not approved, he went for second best or simply took who was expendable.

Table 1: Full-time and part-time project team members (SPC side only)

<i>Module(s)</i>	<i>Number of SP employees</i>	<i>Number of employees assigned full-time to R/3 implementation</i>
FI, CO, AM, AR	6	1
MM	2+ proj. mgr	1 + proj. mgr.
PP	12	2
QM	2	1
PM	4	1
Basis/ABAP4	2	1
Project manager (PM)	1	1 ⁶

SPC project team members were supported by a number of SNI consultants. It was, however, mutually understood that this was a client-led project. On average one consultant was paired with 2 team members from SPC. The consultants were led by an SNI project leader. If more than one consultant was assigned to a particular sub-group of the SPC project team, the consultant with the most experience took the functional lead.

We are trying to have functional leads within our team. We have maybe 6 to 8 consultants on site of which there might be 2 or 3 involved in the financials. We would have one of the three act as a functional lead; probably the most experienced one, background wise or SAPwise. This person would give guidance to the other people in terms of what they should be working on, how they should be working on. He or she would normally work together with a sub-project manager, a role that SPC has provided. L. G. was the key person for financials. Don McLelland is the key person for production planning. S. L. is the key one for quality management. We definitely tried to avoid something like: "The SNI consultants are over there" and "we are here". – M. O., SNI consultant

As soon as the project team was formed, top management selected the 12 members of the steering committee.

The steering committee was assigned almost at the beginning when G. R. was named. We - the senior managers - picked who would be on the steering committee primarily based on functions. Here, we chose the middle managers or the people who would benefit most from the modules once they were implemented – V. M., January 1997 3:241

Similar to the executive committee, the steering committee also relied on G. R.'s and the project team's opinions. They simply wanted to be informed about major issues and involved in decisions such as the question whether a certain type of functionality should be left out of R/3 because it is incompatible with R/3. For example, the steering committee – although only hesitantly – eventually approved leaving both SPC's laboratory information management (LIM) and its nuclear material management inventory outside of SAP.

One of the decisions the steering committee got involved in was: Should we do nuclear materials inside of SAP, or should we develop a system outside? It is a significant decision. The committee members asked very few questions. Basically, they defaulted to the people who understand SAP and know what the nuclear materials system needs. The project team really thought that it should be outside of SAP. The steering committee did not like it, but they kind of shook their head and said, well, we have to go with your recommendation. – U. R.

⁶ Due to his extensive expertise in purchasing, the project manager spent a large fraction of his time as part of the MM implementation team.

Steering committee meetings were called in by G. . . On average the committee convened twice a month. The committee was committed to making decisions quickly to ensure the project would not stall. To keep the meetings efficient and middle management engaged sessions were usually limited to 20 or 30 minutes. It even became a habit that everybody kept standing throughout these discussions.

Overall, the project's administrative structure appeared to be working fine. An SNI consultant commented:

Overall the resolution of issues has been very good. There is a clear process in place to bring them up. It usually goes first to our project team, then to G. R., and – if it is of an even more significant nature - to the steering committee to get it resolved or to get support or priorities established. It may not always work the way we, the project team, want it to, but at least there is a clear process. I think that is absolutely necessary. – M. O., SNI consultant

Project Schedule

Contrary to SNI's advice to go for the Big Bang, G. R. decided to implement the software in three phases (Figures 3 through 5). He had several reasons for this. First, he regarded the Big Bang as too risky. At the time, ERP was still a very new idea – at least in the US - and the trade press was replete with “horror stories” about failed implementations such as that of now defunct FoxMeyer Drugs (WSJ, November 18, 1996). In addition, G. R. knew about several failed attempts by German sister companies to implement SAP R2. Second, he had successfully used the phased approach (to be outlined below) during the implementation of the company's legacy MRP II system (AMAPS) 15 years ago. And finally, while a Big Bang called for the simultaneous assignment of many resources, the phased approach permitted him to spread available resources over time. This promised a better fit with SPC's current shortage of staff. Another positive side effect of doing it in phases was that the implementing company could take advantage of the growing R/3 experience of its staff by reassigning initial project members to later phases of the project.

Ideally, we could have done a Big Bang. There would not have been a phase 1, 2, 3, or 4 just one phase when everything goes in at the same time. But from SPC's perspective they just could not afford those kinds of resources. Therefore, they had to break it up into pieces. In my view that actually lessens the risk because you are focusing on one area at the time. You know, OK gee, the financials will be wrong, but we are still able to produce a product. In short, it avoids that everything comes to a screeching halt. I think, phase coordinated, focused efforts seem to prove out. And with respect to creating more work, I think, everything we have done we would have done for the Big Bang as well. There wasn't too much extra effort in that area for this particular project. SPC's legacy systems were not integrated. Most of them were stand-alone systems. Thus, in our case we had to do very few additional interfaces or data loads because we did a phase implementation versus a Big Bang – M. O., SNI consultant

Phase 2 consisted of implementing the finance (FI), costing (CO) and part of the materials management (MM) module (purchasing and essential materials). Phase 1 was to start in September 1995 and to be completed exactly one year later when SPC's fiscal year ended. The “financials” are generally done first since they integrate with every other module and thus form more or less the “core piece” of it all. In addition, G. R. also decided to implement “purchasing” and “essential materials” which are both part of R/3's MM module. An SNI consultant's comments:

Normally people bring in financials first. Most of the other modules will integrate with those such as MM and PP. Some of the stand-alone modules such as warehouse management you want to do by itself, but that integrates with MM which then integrates with FI/CO. You can bring in pieces like we do here with a module like MM without knowing the inventory management perspective. That was probably the only area that was a little hard to get our hands around. Because when you later decide to do the rest of MM – which includes the inventory -, it does have an impact on what you did previously. So you have to reconfigure some things. SPC decided to split the implementation of the MM module because they are tracking both inventory and their production processes in AMAPS. So it would have been more effort on their side to separate those pieces out so that we could implement inventory management separately. What they tried to do is to leave as much of AMAPS alone and to bring that over in one shot which is going to be phase 2. – M. O., SNI consultant

The implementation of the remaining modules fell either in phase 2 (the rest of materials management (MM), quality management (QM), production planning (PP) or phase 3 (plant maintenance (PM)). Phase 2 was supposed to end in April 1997, while the completion of phase 3 was to coincide with the end of the entire re-restructuring effort in September 1997.

SNI's R/3 LIVE EXPRESS Methodology

SNI brought a relatively simple, but proven methodology called "LIVE EXPRESS" to the project. LIVE EXPRESS aims at helping SNI's clients to rapidly implement while offering professional management and exercising effective knowledge transfer. The methodology distinguishes between 5 consecutive steps: preparation (IP), analysis (IA), implementation design (ID), construction (IC), and roll-out (IR) (Figure 7). Work during each of these steps is supported by an array of tools (see Figure 8) ranging from simple checklists, control books, and MS project templates, over computer-based questionnaires (LIVE Kit Structure), to a full-fledged PC-based demo company called Live Inc. LIVE Kit Structure is a business related GUI questionnaire used to match the customer's business requirements to the features and functions of SAP R/3, to promote iterative discussions during workshops with the customer, and to produce a reduced R/3 implementation guide (IMG⁷). Live Inc. supports SNI consultants in their teaching of project team members (client side) and end-users.

The methodologies the Big 6 work with are really not that much different. All of them are dividing the process into 5 or 6 phases. I think what SNI has brought to bear is a toolset that comes into play within each of those different phases. For example, we would bring LIVE Kit Structure into some of the early phases like the implementation analysis (IA). It's a rule-based system which allows you to go through issues related to configuration – without being on a SAP system⁸ - This really speeds up the process, because a lot of times people don't have the software at that point. LIVE Kit Structure permits you to walk through various concepts of SAP. Like what's a "plant", like what's a "company code"? And you can make some decisions in that system that will then allow you to bypass some other questions that may come up based on your answers to a previous question. Live Structure gives people the opportunity to understand what the impact is of making a decision, what the options are, what the consequences are. So that they feel that they are making a good decision on that particular question. Based on that result, it may throw out 300 other possible configuration options. You don't have to worry about them any longer. So your choice process is streamlined from about 14000 to 4000 or 6000 decisions you need to deal with. – M. O.

⁷ IMG stands for Implementation Guide, a tool provided by SAP to support project teams during configuration.

⁸ This is helpful, because oftentimes people do not have the system installed at that time.

Implementation

As soon as the project team was established, they were announced in the company newspaper⁹. It comes out every two months. There was also a large article written identifying exactly what we expected SAP to do, why it was approved, what it was going to cost, plus that we get outside consultants to help us¹⁰. – V. M., 3:109

Phase 1: Implementing the “core”

The SAP R/3 software arrived in October 1995. Unfortunately, this was only an earlier release (R/3 2.2) of the one that SPC intended to go live with (R/3 3.0). Nevertheless, implementation work started in late November. Aside from the delayed delivery of the software, the project teams encountered a number of other hurdles.

The financial modules. By January 1996, the sub-team implementing the financials started to realize that the business philosophy that drove R/3 was quite different from that guiding SPC’s own business processes. To avoid later problems with maintenance with customized software, the team decided to deviate from prior practices and do it the “SAP way.”

It was January 1996 when I finally started getting a feel for the software. I tried to understand the philosophy behind the way SAP models its business processes, i.e. the ideas the accounting, the cost-accounting theory SAP is built on. To our surprise this turned out to be different from ours. We did not know that until January of 1996. It did not become apparent. The consultants got here right after Thanksgiving of 1995. This is when we started unraveling the software, when we tried to configure it, when we looked at how we do what they call business processes. Since ours and SAP’s business philosophy were different, we had to change our processes to meet the system [requirements]. We wanted to do absolutely no code maintenance. – L. G., FI project team leader

Materials Management module (purchasing and essential materials). Supported by two very knowledgeable consultants, G. R. and two additional SPC team members implemented the purchasing side of the MM module almost single-handedly. The end-user community was only marginally involved. Due to his extensive experience in the area, G. R. only seldom requested their advice. Unexpectedly, one of the consultants left in February. A new one was brought in shortly thereafter. With most of the configuration work done by that time, the second consultant started focusing more and more on the implementation of the PP module that was supposed to come in with phase 2.

On the essential materials¹¹ (EM) “front” (part of MM), P. J. and another team member gave their best in implementing their portion of the system. Since he had not received much formal training prior to heading up the EM portion of the project, P. J. was more or less left on his own to learn the workings of the system.

When we first started, it was confusing, almost hopeless. How am I ever going to be able to understand all this? It is tough. I basically self-taught myself along with help of the consultants on how

⁹ See Figure 2

¹⁰ See Figure

¹¹ Essential materials refers to anything that is required on SPC’s shop floor to operate. It includes mob heads, labels, some parts, sample bottles for analytical bottles, safety glasses, bulk materials

to set up the essential materials inventory within the system. And then I made configuration changes to make the system work the way we needed it. – P. J.

To P. J.'s disappointment, the involvement of middle management was rather low. Since they did not provide all the necessary input needed for implementation, P. J. ended up redoing some parts of his prior work.

We have created special queries and reports in the system to tether the information for the management. If I had to do it over again, I would make sure that I get more input, particularly from management, what kind of reports that want because that will really affect how you implement your system. It is very important. – P. J.

Since many activities in the essential materials area were done manually, most of the staff was computer illiterate. To ensure that he would get buy-in by the four end-users in his area, P. J. put a lot of extra effort into making them familiar with/and less afraid of the system. One of his strategies to achieve this was to involve them early in the project. This had the additional benefit that he got help in entering all the data that were until then only kept manually.

Due to the delay of R/3's release 3.0, the "phase 1"-project team started to work with an earlier (but less powerful) version of the program. This caused G. R. some headache because final integration and testing had to be done with 3.0. since 2.2 lacked major portions of 3.0's functionality. When release R/3 3.0 finally arrived in July 1996 it was full of bugs. This and the fact that much of the functionality SPC required was only available in 3.0, led to a high pressure effort of the project team from July to October.

The system went live October 1st, 1996 – on time. Now it became essential to get end-users on board as quickly as possible. As to the timing of the training sessions, G. R. found himself in a chicken and egg situation: If he trained them too early they would not see the importance, show a lack of interest, and were unlikely to retain much. In short, he would wind up wasting money. Alternatively, if he started training them one month prior to going live – which would be about the right time frame -, they would not have the time to dedicate themselves to training. In September many employees are taking their vacation, thus leaving those working with higher work load. Moreover, September 30 marks the end of SPC's fiscal year; i.e. in addition to their usual activities, accounting staff also had to close the books. Given that much of the project team's time prior to implementation was tied up in testing and making final fixes, the trainers' time was limited as well. G. R.'s only option, thus, seemed to be to perform most of the training *after* the system went live.

From October through mid-November, we went pretty crazy supporting then end-users and being there for them. They were spending the long hours, they were having to learn their jobs all over again. Not by their choice, it was my choice. – G. R., January 1997

Not surprisingly, in many – but not all¹² – cases, the initial user reaction ranged from surprise about the arrival of the system, over frustration, to outright resistance.

We went live in October 1st, 1996 and I probably, did not have a lot of hands-on experience at that time. It was just kind of thrown at us. – H. J.t

To ease the pain, G. R., the consultants, and other key members of the project team dedicated much of their time on training for the following 6 weeks.

¹² E.g. end-users of the essential materials

In fact, we were kind of shell-shocked! I am still going through a learning curve. G. R., being the good guy that he is, he is down here, whenever we have problems. G. R. had some seminars showing us what it is going to be like. "This is your new function! Forget about how you used to do it." And then one day, it was brought up, and it was all online. G. R. has spent 5 days in this receiving office, making sure that we knew the system because we were actually now paying the bills for the freight by be entering in. There was not too much training at all. It was all on the job training. Which is - I did not mind. It was working out pretty well! – B. A., January 1997, 4:45

In addition, G. R. decided to write "procedures": these are user manuals that are designed to take the end-user through an entire transaction step-by-step. Writing these procedures had two advantages. First, it provided the project team with some breathing space since end-users could get answers to frequently asked questions by looking up the respective procedure. Second, the procedures served as documentation. They were made accessible online via the LAN. A FI end-user comments:

We can follow the scripts that they gave us, but if something happens that is not on those scripts, we are finding that we don't know what to do. Then we are kind of fumbling around in the system. People are asking us things like how many payments are to this purchase order? And we get this panicky feeling because we don't know how to look it up.

The end-users' perception did only gradually change. It took about 3 months for the user community to warm up to the new system

There were many negative feelings. But now that I have moved down the learning curve, I can see its benefits for our plant and for my job function – now that I finally understand it. – B. A., January 1997

Despite all these problems, it was generally acknowledged that phase 1 was a big success. But by the time phase 1 went live, phase 2 and 3 had already started. Due to the different nature of the business processes to be configured, the challenges faced in phases 2 and 3 were quite different from those faced during phase 1.

Phase 2: Overcoming major hurdles

Phase 2 involved the implementation of the rest of the MM module (i.e. the inventory portion), all of PP (production planning), and quality management (QM). From the very start, it was much more complex than phase 1.

Phase 2 was much more complex than phase 1. It had production as well as QM with the QM modul being completely new to this company. We did not have an automated quality system before. Overall, phase 2 was a much larger scale project. – L. G., April 1998

To the disappointment of many involved in phase 2, after the initial success with phase 1, the project seemed to have lost some of its momentum. Also, many of the consultants had left and it appeared as if management has become less enthusiastic about the effort. G. R. noted:

At the executive (top management) level, I continued to make my regular appearances. Management allotted me a short period of time and I was able to take advantage of that short period of time and keep them abreast of what going on. The next level down, though, from management, they had lost a lot of enthusiasm. – G. R., April 1998

To better understand why this happened it is important to know that SPC's business is of a seasonal nature – with the busiest times being winter and summer. Thus when phase got into its critical stage in the first quarter of 1997, only a limited number of people were available to help implement.

And they did have trouble getting commitments from some people away from their normal jobs. Of course, that's difficult when we had relatively high production periods up until March. So, some of those people simply could not spend the time with SAP.

In addition, SPC got a "rush order" from a brand-new customer in February. Given its rather stable and highly predictable business, this came entirely unexpected. As a result, much of the manpower originally earmarked for the SAP effort was absorbed to fulfill the order. By the time, these people were available again it was March.

Production Planning. Work on the PP portion started back in April 1996. Around February/March one of the consultants previously involved in phase 1 began spending more and more time on this part of the project. One major disappointment concerning the implementation of the PP module was when the project team came to realize that the functionality of SPC's lab information management system (LIM) could not be mapped into R/3. G. R. explained:

We have an analytical lab that processes millions of tests every year. Those millions of tests could have been production orders but we would have had millions of production orders simply related to test. As it is with our production system, we are going to have thousands of production orders but less than ten production orders in any given year. By mapping this functionality into R/3 we would have to go from 10000 to a million. To me it was simply wrong to put it into SAP. We needed specialized software there. – G. R., April 1998

As early as October/November it became apparent that the implementation of the PP module was behind schedule. Three months later, by the end of January 1997, the PP consultant quit for private reasons. SNI quickly brought in two new consultants who were able to help the PP team configure the system. However, they lacked the detailed knowledge about the company that the previous consultant had acquired over the past year. In conjunction with the scarcity of human resources caused by the demand of the rush order received in February, there was no way to go live with the system as originally planned. The cut-over date of the system was delayed twice. Eventually, the system went live towards the end of May, but it operated only inefficiently.

Quality management. In quality management (QM) area, a number of major problems needed to be resolved before this portion of the project could begin. While work in this area was supposed to start at the same time as P¹³, the QM team got seriously involved only in August. Until June, G. R. was desperately looking for an internal resource who would be able to implement the QM portion. S. L. – his first choice – was tied up in another project. When he had finally completed this task it was June. Immediately, S. L. looked for training. But much to his surprise, he could not find any. At the time, SAP was in midst of revamping its entire course program to adjust the content of its courses to the increased functionality of its software; i.e. from R/3 2.2 to R/3 3.0. The training offered was very "core" – or in other words useless. One of the courses even got cancelled after S. L. arrived for class. A lack of expertise in QM was not his

¹³ PP and QM are highly integrated. It is highly recommended that the teams implementing these modules communicate frequently and know about each others activities.

only problem. As he found out soon, due to the high level of integration between QM, on the one hand and PP and MM on the other, he would also need some knowledge in both MM and PP.

For QM you really need to know the MM and the PP modules. So that you can actually test and facilitate. Usually it is hard to go to the MM and PP guys and say I need you to set this up for a test since they are working on figuring out their own problems. – S. L., QM project team member

Finding a knowledgeable QM consultant turned out to be problematic as well. SNI did not have one on its payroll and thus could not help out. It became August before they could finally contract one. With the help of the consultant – who at the beginning – could only spend a limited time at SPC, S. L. gradually came up to speed. When the consultant was finally able to spend up to 40% of his time at SPC (starting in September 1996), they eventually made good progress. By this time, however, both the MM and PP teams had already gone ahead and configured many of the business processes that also involved QM. S. L. noted:

I wanted to do traceability. We needed to have that. The initial reaction [from the MM team] was, you know, well you can do it, but we don't care. Then we had the issue with batch management. When the issue was brought onto the table, the MM people were going, well, we don't know whether we want to have batch management because that means more transactions. Instead of handling just quantities, now we would now have to issue by batches. The PP on the other hand really did not seem to care until they said we want to do direct production. The problem with this is that in direct production you can't use batches ...

Another problem he faced was lacking management support in the quality organization. As a result, the buy-in of the user community and their willingness to support S. L.'s efforts turned out to be insufficient.

S. L. became very frustrated towards the end. Because he wasn't able to get some of his co-workers to go along with him on the project and really embrace the software and learn how to operate the business that way. So S. L. felt like he was out there all by himself. – G. R., April 1998

By the end of December the basic portion of the QM configuration work was done. By now S. L. was an expert in QM. His market value was reaching levels that could easily earn him three times the money he currently earned at SPC. Unfortunately for SPC they could not match this since a salary raise of this magnitude was out of question due to the company's existing salary structure. Furthermore, in contrast to the exciting job challenges S. L. would encounter as SAP consultant, SPC did not have any interesting jobs to offer.

S. L. decided to leave by mid July, shortly after the QM module went live. Before he left, he brought up to speed the key users that would continue his work. After his official departure SPC hired him back – at a competitive consulting rate – to fill in where they had yet been unable to replace his expertise.

Materials Management. In the MM area things were not going that well either. Much to the disappointment of middle and top management, it turned out that another legacy system whose functionality they wanted to have integrated into R/3 could not be mapped into the system due to incompatibilities between SPC' requirements and R/3's features.

Anytime that we decided to exclude something from the project, such as the nuclear materials inventory system, it was very disappointing to management we weren't integrating everything. And they were wondering, were we disintegrating? Were we just making a good solution worse? But SAP is not a data warehouse. SAP is more of a system. One area where we decided to leave things outside of SAP was the nuclear materials inventory which is a horrendously large and complex inventory with lots of characteristics about the material and all the little buckets and containers that we have. An Oracle database allows you to look at this large inventory in any which way you might want to. You can look at it in the production view, the reporting view, customer view, the

governmental regulatory view. All of these features really made sense and it was better to keep them outside of SAP. – G. R., January 1997

In May 1997, approximately one month before the MM system was scheduled to go live, major testing began. Learning from past experience with user resistance when going live with phase 1, the project team intended to heavily involve end-users into the exercise. Overall, this attempt was successful, even though it slowed down testing considerably. Since the live date was kept fix some additional testing needed to be sacrificed.

We conducted what we called a robust test in May. What that ended up being was more, not only a confirmation of how we configured it, but it really turned into more of a training exercise for the people that were putting it in. So it kind of slowed us down, but we did get a lot of good benefit from the training part. – L. G., April 1998

As a consequence, some of the configuration errors only surfaced after the system was already in production. By June, material planners noticed that they were getting by too much demand:

The problem dealt with the bill of materials and MRP. The system didn't calculate the raw material properly. It was actually double counting and triple counting some of the raw materials. So, in the testing phase, we had a real controlled test. They may or may not have noticed that, but they did notice that it was calculating each line item properly. What we failed to catch is that it was calculating too many line items. The problem deals with if you have a component that can use as many as two or three alternative raw materials in a particular situation, it was calculating the raw materials for each one instead of just picking only the optimum one. – L. G.

Phase 3: Plant Maintenance

In contrast to phase 2, implementation of the plant maintenance (PM) module in phase 3 – went in relatively smoothly. The start of phase 3 was originally planned for June 1996. As nobody could really find a good reason for why they should start that late, phase 3 began about half a year earlier; in January 1997. As a positive side effect, the team was able to reschedule its live date and go live by the end of April; at least one full month prior than planned.

After going through three or four less qualified consultants, the PM team finally could latch onto a consultant who knew the module really well. This and the dedication of the key users who more or less worked fulltime on the system was a major reason for the success. Luckily, the maintenance organization was run on a different schedule than the rest of the plant. Thus, while the implementation of the phase 2 modules was significantly slowed down because of SPC's production process, the PM team could follow its implementation plan undisturbed.

To ensure maximum user acceptance, the PM team sought to provide their large group of end-users (about 50) with as much training at the right time as possible. In addition, they focused on configuration of user friendly displays; that is, they programmed shortcuts (so-called area menus and hot button) to make the end-users' lives as easy as possible.

I think one of the big success factors was training. We did a lot of training with our craftsmen so that they understood what the system was. We did up-front training and then we did follow on training. Also, I think the other key there was the implementation of area menus that made it much more user friendly to work in SAP. The use of area menus helped us a lot in making it easy for the craftsmen to get to the screens that they need to get to. – K. G., April 1998, PM

The only problem they encountered had to do with the configuration of the preventive maintenance part of the module. When they could see they would not be able to figure out how to properly configure this portion until the advance cut-over date, they decided to separate its implementation from the rest of the module. The preventive maintenance portion went live by the end of September 1997.

Adding HR

In addition to restructuring "idea #15" which called for "getting rid off the IBM", another restructuring idea found its realization through SAP.

The timecards implementation was a separate project. We had a paper-based timecard system before and wanted to replace that with an electronic one. So what we did was look at several packages and we found that SAP offers this functionality. It was a separate product we had to buy; or in other words, we had to pay the license fees and get the HR module. We put in just enough of the employee master records, the main service dates so the vacation would calculate properly ; just the award code, and exempt, non-exempt, and the name. That's about it: Just enough to get the time management system to work! – L. G., April 1998.

After confirming that timecards could be implemented in R/3 without any major headache, L. G. started with configuration in January 1997. The system went live in April together with plant maintenance. Since the decision to implement the timecards system was based on another re-structuring idea, it directly contributed to the company's original restructuring goal of reducing costs. For this reason, it was not be considered project creep, but rather an elegant way of integrating one restructuring idea with the another.

What else happened?

Before going live with the last module, G. R. decided to leave the company. Frankly, nobody had anticipated this move. After all the turnover rate in the nuclear fuel industry is very low. G. R. had been with the company for 23 years. But now other opportunities opened up. His considerable SAP expertise and wide-ranging knowledge about the system made him a highly attractive job candidate for SNI. Attracted by both the job challenge and a considerable salary raise, he decided to leave SPC by the end of June 1997.

L. G. took up his place about one month later and is now in the process of perfecting what the company had accomplished over the previous two years despite the many problems faced along the way: the completion of a full-blown R/3 implementation on time and on budget.

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Appendix

Enterprise Resource Planning: overview

The term enterprise resource planning (ERP) was reportedly coined by analysts at Gartner Group. ERP software is designed to model and automate many of the basic processes of a company, from finance to the shop floor, with the goal of integrating information across the company and eliminating complex, expensive links between computer systems that were never meant to talk to each other (CIO, November 1997). "As part of their design, integrated systems allow information to enter at a single point in the process (for example, at the materials receiving stage of a manufacturing process) and update a database for all functions that directly or indirectly depend on this information. This integration should take place in real-time, not through interfaces or programs that transfer information to one or more modules only after the information has already been processed and updated in the module through which it entered the system. Once placed into the system, the information should be available in all the necessary forms through which it may be accessed, throughout the system." (Lozinsky 1998, p. 16)

ERP systems are sold by many different vendors. The five most well-known are SAP, Oracle, PeopleSoft, Baan, and JD Edwards. While they compete with each other in the same market, it is important to note that their systems differ significantly from each other. Each system has its strengths and weaknesses which are rooted in its individual development history. None of the systems is superior in every respect and how well it can support a particular business is very much determined by the fit of its design characteristics with the requirements of the customer's business.

SAP AG, a German software company, was one of the first vendors in the ERP market. It started its business in 1972 and soon enjoyed moderate success (mainly in Europe) with its first major package called "R2"¹⁴. The problem with R2 was, however, that its architecture was mainframe-centric and its user interface extremely cumbersome to use. SAP's chances to extend its business beyond Europe appeared limited. However, when "client/server" architecture became popular, SAP revamped its system to benefit from the new approach. The result was R/3 – a client/server based ERP system that offers R2's advantages, while overcoming many of its weaknesses including the user interface problem. Today, SAP enjoys major success worldwide (currently: 16,500 installations)¹⁵. It is the market leader in ERP software and the 4th largest software company overall.

Short description of major modules implemented by SPC:

<i>R/3 module</i>	<i>Description</i>
Finance (FI)	Collects all the data in the company relevant to accounting, providing complete documentation and comprehensive information, and is at the same time and up-to-the minute basis for enterprise wide control and planning. (R/3 brochure)
Cost Controlling (CO)	A complete array of compatible planning and control instruments for company-wide controlling systems, with a uniform reporting system for coordinating the contents and procedures of the company's internal processes (R/3 brochure). The module includes costing, cost center, profit center,

¹⁴ R2 stands for release 2. R/3 stands for release 3.

¹⁵ See: <http://www.sap.com>

Materials Management (MM)	<p>and enterprise accounting and planning, internal orders, open item management, posting and allocations, profitability analysis, and a variety of reporting functions. (Bancroft 1999, p. 32)</p> <p>Materials management covers all tasks within the supply chain, including consumption-based planning, purchasing, vendor evaluation, and invoice verification. It also includes inventory and warehouse management to manage stock until usage dictates the cycle should begin again. (Bancroft 1999, p. 34)</p>
Plant Maintenance (PM)	<p>Provides planning, control, and processing of scheduled maintenance, inspection, damage-related maintenance, and service management to ensure availability of operational systems, including plants and equipment delivered to customers. (R/3 brochure)</p>
Production Planning (PP)	<p>Provides comprehensive processes for all types of manufacturing: from repetitive, make-to-order, and assemble-to-order production through process, lot and make-to-stock manufacturing, to integrated supply chain management with functions for extended MRP II and electronic kanban, plus optional interfaces to PCD, process and control systems, CAD, and PDM. (SAP R/3 brochure).</p>
Quality Management	<p>The quality management capability plans and implements procedures for inspection and quality assurance. It is built on ISO 9001 standard for quality management. It is integrated with the procurement and production processes so that the user can identify inspection points both for incoming materials and for products during the manufacturing process. (Bancroft, 1998: 34)</p>

Figure 1: SPC's Budget break down



**SAP R/3 Implementation Project - Job R104
Through September 1996**

fiscal year ends in September!

(\$000)	94/95		95/96		96/97		Project Total	
	YTD Actual	Budget	YTD Actual	Budget	YTD Actual	Budget	Actual	Budget
SPC Labor	40	-	404	708	-	418	444	1,126
CIS Labor	50	70	177	345	-	236	227	651
Consultants	135	-	1,015	903	-	510	1,150	1,413
Training/ Travel	15	-	58	150	-	50	73	200
Software	-	-	387	273	N/A	127	387	400
IA? Study	-	200	200	-	-	-	200	200
Expense Total	240	270	2,241	2,379	-	1,341	2,481	3,990
Hardware	-	-	158	170	-	100	158	270
NIMS	-	-	72	100	-	-	72	100
Capital Total	-	-	230	270	-	100	230	370
*Project Total	240	270	2,471	2,649	-	1,441	2,711	4,360

*Excludes contingency of \$1,043 not yet authorized

Siemens Power Corp. N.D.
SAP R/3 Project
CIS Idea#15

Proprietary

10/14/96 11:13 AM

Figure 2: Company news letter

October 12, 1995

UPDATE

PARTNERS
COMMITTED
TO
QUALITY

SUCCESS FUEL

New Information Management System Approved

SPC Management gave its full endorsement and authorization at the first Phase 3 Management Team Meeting to proceed with installing a new company-wide information management system at SPC. This system will, when implemented, integrate financial, manufacturing, nuclear material inventory, plant maintenance and fuel design (e.g. Parts Lists) data using a single common computer software package, R/3, developed by SAP, Inc.

The R/3 system is expected to take two years to completely install and will be managed by a Team with representation from all organizations at SPC, headed by Rob Guay. Although expensive to implement, this integrated software system is expected to produce significant improvements in replacing many of the existing data management systems in use today. According to Rob Guay, "No company can expect to achieve world-class status in today's market environment without a state-of-the-art integrated data management system, which SAP provides. This system offers SPC the best chance to approach a true paperless data management system needed to take SPC into the next millennium."

Another result of the installation of R/3 will be the replacement of the IBM 4381 computer. The IBM 4381 was originally installed in 1980. The replacement computer will be an RM600 computer, manufactured by Siemens Nixdorf. The new computer will be less costly to operate than the IBM 4381. The computer will run a UNIX operating system and Oracle relational database software to support the R/3 system.

The removal of the IBM 4381 will result in the replacement of the IBM terminals with PC's running Microsoft Windows software as well as the R/3 client software which will communicate with the R/3 server running on the RM600.

During the implementation period, SPC implementation personnel will be assisted by consultants from Siemens-Nixdorf. The experts from Siemens-Nixdorf will provide valuable advice in the transition from our existing systems to the R/3 system. The integration of all the existing systems into R/3, use of the latest technology/hardware, and the re-engineering of business processes to be compatible with the R/3 software are the objectives of the Siemens-Nixdorf consultants assigned to the project.

Beginning in the next few months, additional information will be made available regarding the plans, schedules, and implementation efforts as this system implementation gets underway. Your support and cooperation is needed to ensure the successful implementation of the R/3 system.

RESTRUCTURING OUR COMPANY
FOR THE FUTURE

Released by Employee Relations SPC-ND: 1120.010 New (10/2/95)

Source: SPC

Figure 3: Project Schedule (as of January 1997)

INTEGRATED MANUFACTURING SYSTEM SAP PROJECT SCHEDULE

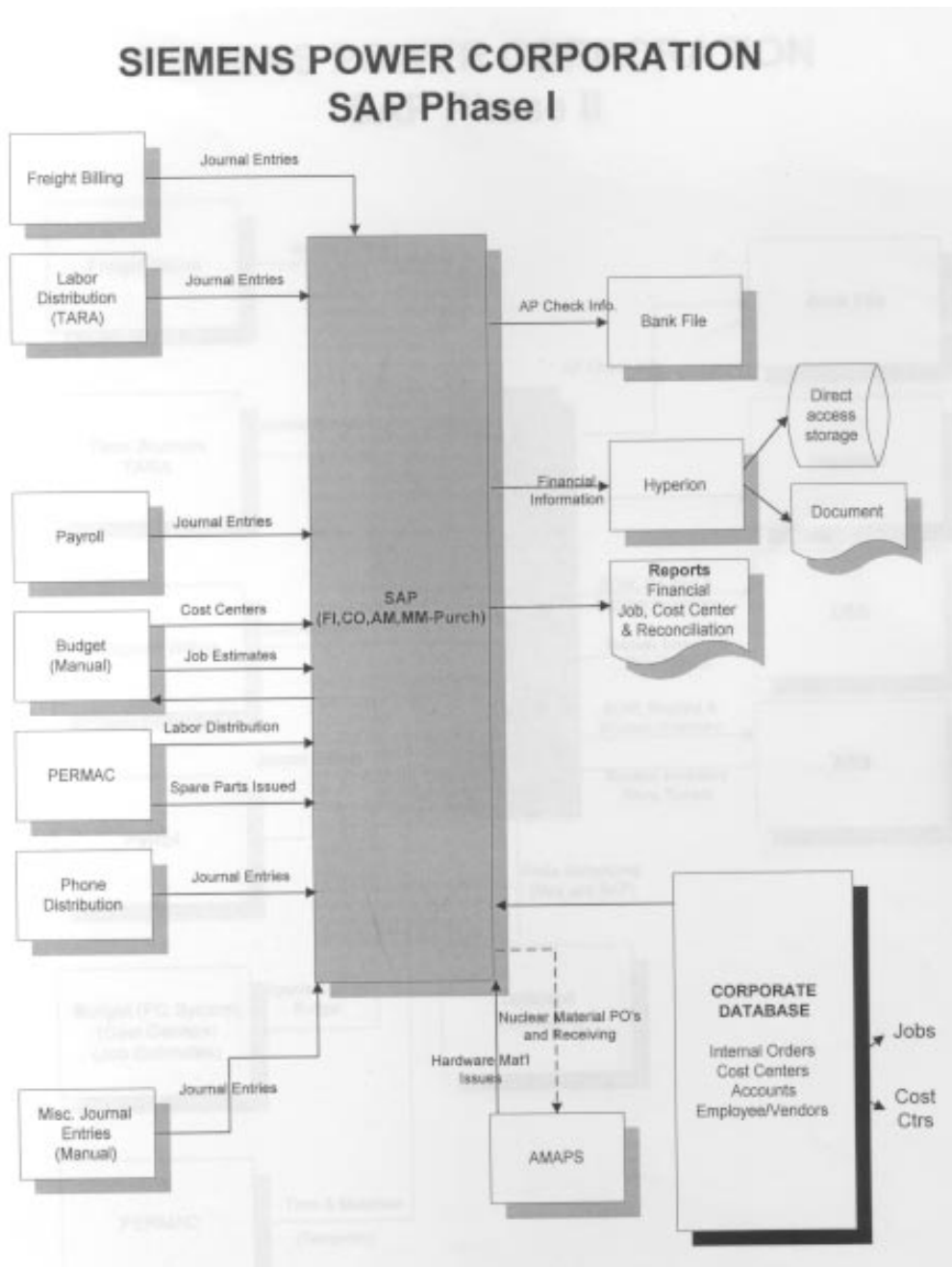
	TASK DESCRIPTION	1995	1996 CY				1997 CY			
		Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	PHASE 1 - FINANCIALS/ PURCHASING/ ESSENTIAL MATERIALS									
1	INSTALL HARDWARE / SOFTWARE	■								
2	CONSTRUCTION OF SOLUTION									
3	DEVELOP PROCEDURES / PERFORM TRAINING									
4	GO LIVE ! - COMPANY WIDE (FIN / PUR / ESS MATL)									

	TASK DESCRIPTION	1995	1996 CY				1997 CY			
		Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	PHASE 2 - MATERIALS/ PRODUCTION/ QUALITY									
1	CONSTRUCT MTLs./ PROD. SOLUTION									
2	DEVELOP PROCEDURES / PERFORM TRAINING									
3	GO LIVE ! - COMPANY WIDE (MATERIALS / PRODUCTION / QUALITY)									

	TASK DESCRIPTION	1995	1996 CY				1997 CY			
		Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
	PHASE 3 - PLANT MAINTENANCE									
1	CONSTRUCTION OF PLANT MAINTENANCE SOLUTION									
2	DEVELOP PROCEDURES / PERFORM TRAINING									
3	GO LIVE ! - COMPANY WIDE (PLANT MAINTENANCE)									

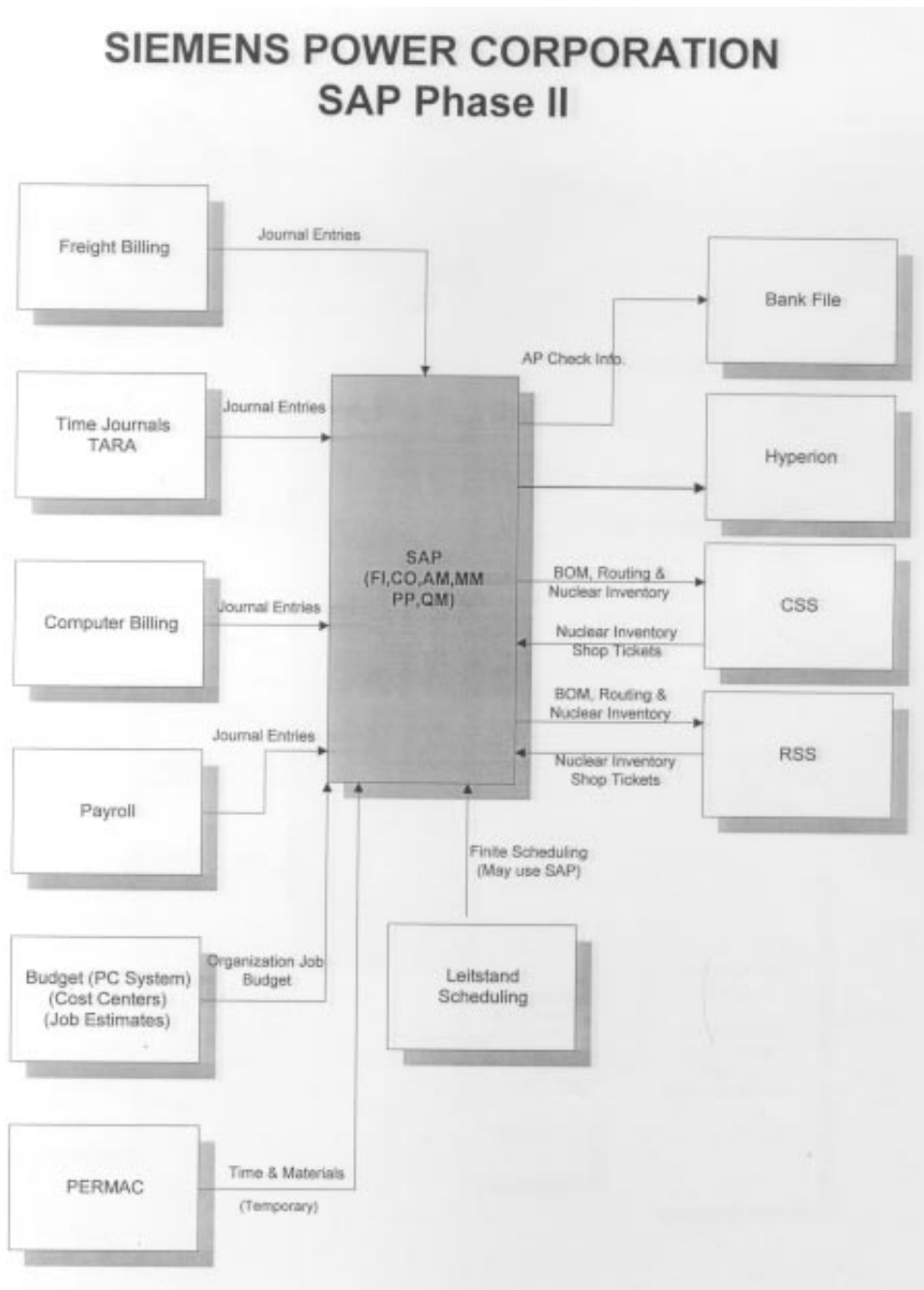
Source: SPC

Figure 4: Phase 1 - Integration of SPC's first R/3 modules with its legacy systems



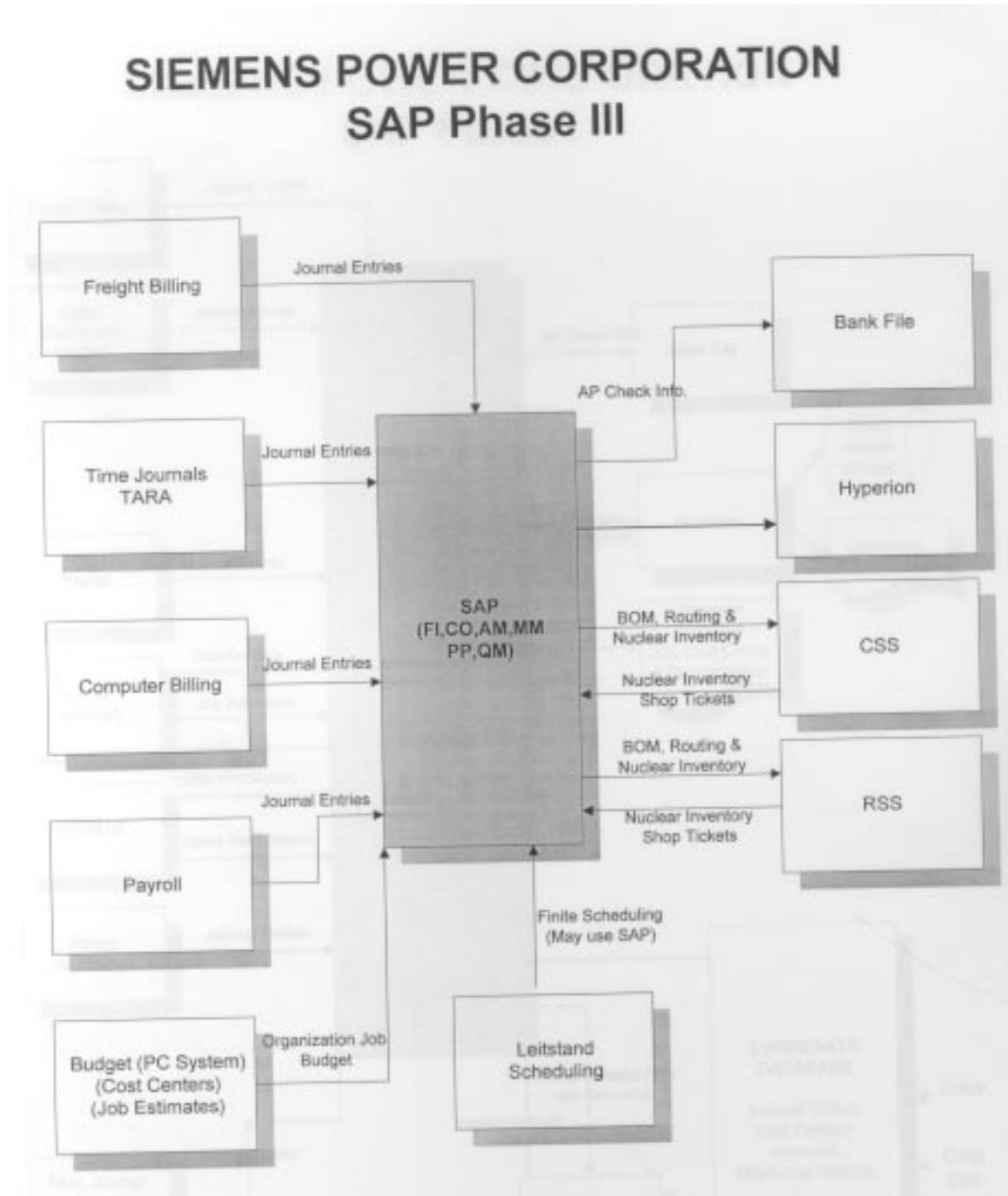
Source: SPC

Figure 5: Integration of R/3 modules with legacy applications in phase 2



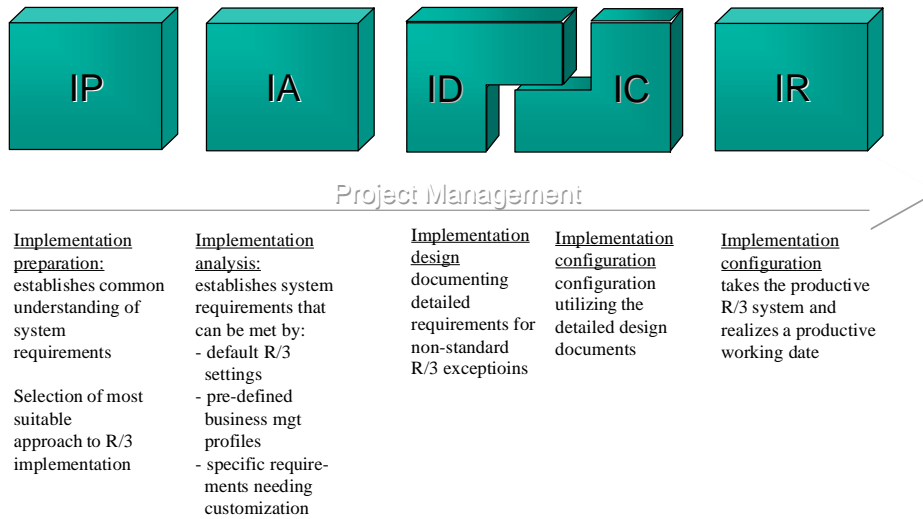
Source: SPC

Figure 6: Permanent interfaces: Planned systems architecture after going live with all R/3 modules



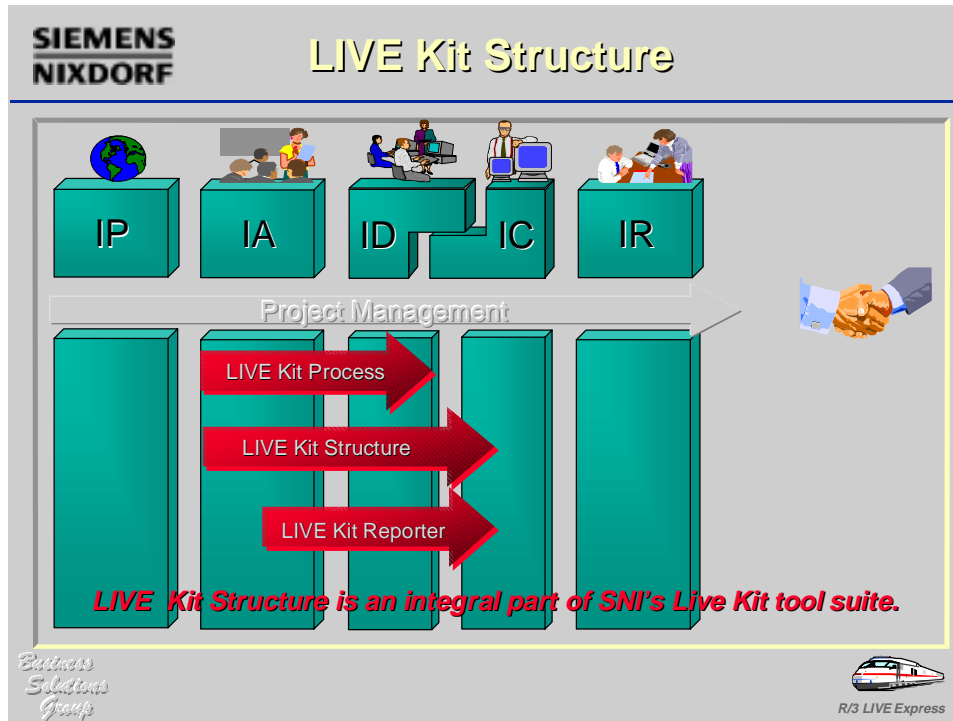
Source: SPC

Figure 7: LIVE Express Methodology



Source: SNI (adapted)

Figure 8: Tools supporting SNI's methodology



Source: SNI