

The Success of the SPI Efforts in India

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Summary

Over the last few years many Indian software companies have been assessed at level 4 or 5 of the software CMM. This note examines some of the reasons behind this spectacular success, based on author's experience with many of the high maturity organizations in India, and inputs from various industry leaders and consultants. The factors have been grouped in three categories – people based, business related, and management related. The note shows that the reasons are a mixture of business necessity, natural advantages, and smart management.

Introduction

The software industry is a relatively young industry in India, with most of the organizations being less than 20 years old. The boom and growth in the industry really came in the late 90s, after the economic liberalization within the country. (With liberalization, import export restrictions were eased which made it much easier to import computing equipment and export software services without government permission, import duties were slashed resulting in reduced cost, and government regulations for starting companies eased.) Starting with a total turnover of less than \$100 million before 1990, the total turnover is now over \$5 Billion! The industry has been growing at over 50% every year since around 1995. Information technology and IT-enabled services are projected to become a \$50 - \$80 Billion industry before the end of this decade. Overall, the industry has done remarkably well, continues to do so, and is expected to do so for the foreseeable future.

The Indian software industry has been maturing in many dimensions. In the value chain, it started primarily as a subcontractor for technical manpower. Later it gradually shifted to doing complete parts or phases of projects, usually the later phases of coding and testing. From this, it matured to providing complete solutions off-shore (i.e. in India). Today most leading companies are operating in the high-end software services business and are also making efforts to enter the products segment.

The industry has also matured in the process and quality dimension. In the early days of technical manpower based solutions, the focus was squarely on software work-products. As the nature of work changed, the process orientation also took its root. When ISO9000 was introduced in early 90s for software [ISO87, ISO91, ISO93], Indian software industry quickly adopted it in an effort to improve its quality processes and gain recognition. Hundreds of software companies got ISO-certified. In the last five years or so, for process improvement, almost the entire industry moved over the software CMM [Paulk95]. And in keeping with their tradition of fast pace, within a few years, a large number of software companies matured to level 4 or level 5. India now has more than half of the total high-maturity organizations that are in the SEI's database.

This rapid move to high maturity, which is somewhat contrary to the conventional wisdom that SPI is a slow process, has lead to speculation and discussions about the possible reasons for this

phenomenon. Some articles have also been written on this [Batra98, Paulk00]. This note attempts to explain some of the reasons behind the success of Indian software organizations with SPI. The observations and explanations are based on the authors experience with implementing a high maturity level in one of the premiere organizations in India (the implementation itself is described in [Jalote99]), helping some in reaching high maturity levels, and conducting a study on use of metrics in high maturity organizations [Jalote00]. Inputs and feedback have also been taken from many industry leaders in India and from some assessors/consultants operating in India.

Many reports have been published in literature regarding SPI efforts in specific organizations. This note focuses not on an organization but on trends in an industry in a country. Obviously no simple explanation can fully explain the phenomenon, and there are likely to be many contributing factors. The factors discussed in this article have been grouped in three categories – business related, people related, and management related. For SPI efforts, these categories cover most of the key factors.

Business Related Factors

- Services nature of the business. The Indian software industry is primarily in the service sector, which globally has responded to SPI more (as compared to the products sector). Perhaps due to being directly customer driven in projects, processes become important. Also, traditional process models seem to be better suited for the services sector (indeed, most process models seem to imply there is a customer from whom the requirements are elicited). This services orientation helped build a need for process-orientation and SPI. It may be mentioned that the Indian software industry focused on the service sector as this sector requires low investments and has a quick cash flow. (One of the leading companies with multi-billion dollar market capitalization is known to have started with a capital of less than \$300!)
- Export orientation. Indian software industry is primarily export oriented, with USA, Europe, and Japan as the major markets. As the customers are from all around the globe, the need to follow globally acceptable frameworks and standards was there. This created a need for employing frameworks like the ISO9000 or the CMM. Furthermore, in the USA and Europe, customers started demanding the ISO certification or some CMM maturity rating, which gave further boost to the adoption of ISO and CMM. It is, however, worth noting that though many Indian software companies were motivated by the need for certification to “prove” their credentials to their customers, most were smart enough to use these frameworks to also deliver what the frameworks are for – namely, software process improvement.
- Offshore Model. In early nineties some of the Indian Software companies pioneered the concept of providing the service to USA customers from India (Offshore Model). While the proposed model was promising a win-win situation (cost advantage to customer and supplier both) yet it was an uphill task to convince the customers that a company could service them from a distance of thousands of mile away. Besides other things, the process orientation and documented Quality system based on a globally accepted quality model (ISO, CMM, etc) was one of the most critical factors that influenced the decision of customers in favor of offshore model. SPI became a necessity for the offshore model to work!
- Subcontracting interface. Most of the work to Indian software companies comes from Fortune 500 type of companies, core business for many of who is not software. These companies are subcontracting out their software work to companies in India. Managing subcontracted work typically requires some monitoring structures in place which also help reduce the risk. This imposes some formality at the interface between the users and developers – something that is

generally hard to achieve with in-house development. The need for this formality requires clearly defined processes with good visibility into them, which gives an impetus to SPI efforts. Besides formality in specification, which the subcontracting interface generally imposes, it also requires better monitoring of costs (i.e. effort) and schedule, which gives a boost to measurement programs, which, in turn, help in achieving higher levels of maturity.

- Core competency. Most software organizations are software-only company. This means that doing software is their core competency. In order to improve in their core business, they have to continually improve their processes, which keeps the focus on SPI. In organizations where software is a support activity and the main business is something else, or where software forms one of the components of a larger system, it is probably harder to get SPI the necessary attention of the senior people.
- High growth. Software industry got an opportunity to grow fast and it grabbed it and went on a high growth trajectory. This trajectory required infusion of a large number of new engineers in the organization every year. Without tightly controlled processes and organization, it is not possible to absorb this rate of growth well. Hence, to handle the high growth, most software companies needed solid processes for executing software projects. This was realized and models like ISO and CMM were used to provide the necessary support to handle and control the rapid growth.
- Cost factor. The cost of manpower is not very high in India, and a typical software company might be spending about 1/3rd of its expenditure on manpower. This makes dedicating a team for SPI for long term benefits cheaper. A survey of high maturity organizations in India indicated that most companies had dedicated manpower for SPI equal to about 1-2% of their engineering manpower [Jalote00].
- Disappearing cost advantage. In the start, the Indian software industry got business on the comparative cost advantage it offered. Over the years the costs have gone up, and many large companies have reached a stage where they are finding growing at desired rates difficult just by adding more manpower. Hence, there is a need to continually increase the rates, which means that the cost advantage is continuously reducing. The Indian software industry realized that it cannot compete on cost alone and must change the value proposition from cost to quality. This generated a strong business need for SPI.
- Age of the industry itself. Most of the software companies in India are very young. They had the advantage of the collective knowledge and experience of organizations world over. They introduced quality systems very soon after they were formed (in many cases due to early adoption of ISO). This ensured that the company had a way of working to which each new entrant had to conform. After that, the company, the people and the quality system have all matured together. As the people in the company have contributed actively to the SPI movements right from early days, this has induced a sense of ownership for the quality system in the practitioners.
- Peer and marketing pressure. There is a pressure from the marketing divisions of many organizations to reach higher levels of maturity or get ISO-certified, which, in turn, is generated by customer perceptions. When some companies achieved higher maturity levels or ISO certification, it also generated pressure on other software companies to follow suit and “not be left behind”, which gave impetus to framework-based SPI.

People Related Factors

- Software manpower – Due to the opportunities the software industry offers (a higher financial remuneration, overseas travel opportunities, respect in the society, etc.) best of the people started going to software (e.g. in the Indian Institutes of Technologies, the highest rankers in the entrance test choose to go to computer science.) Before the boom in the software sector,

engineering, along with medicine, was the preferred career option for the educated middle-class Indians. So, the best of the young minds find their way into the software industry. The personality of the people joining the software industry also seems to be different. Some of the CMM lead-assessors have observed that the scores on the Briggs-Myers personality tests (which are sometimes conducted as part of the assessment) throw up personality types that are different from the types that are thrown up in the US. This manpower is ambitious and wants improvement in the way the organization works, which creates a need for process-orientation and improvement.

- **Age of Engineers.** Average age of the engineers is in 20s and that of managers is late 20s to early 30s in the Indian software industry. This is largely due to the young age of the industry itself – most of the growth in the industry has taken place in the last 10 years. The high growth rate ensures that people move up faster, keeping the average age of engineers and project managers low. This helps in various ways, one of them being that engineers and project managers are quite receptive to change, as they have not invested too much in some specific way of working, and indeed want changes. Also, youth allows for hard work, positive approach to life, etc. which helps considerably in implementing SPI.
- **Engineers employed more than computer scientists.** Most of the software companies employ engineering graduates rather than computer science graduates (the computer science graduates tend to go to technology companies.) In fact, in the services sector companies, almost all the recruits today might be engineers (or science graduates.) Engineers generally are more process oriented than computer scientists. For example, An engineer learns in his education that to build any system, one has to first design it and validate the design, before actually building it. This type of background helps in building a process-oriented work culture for software development, with phased development and intermediate work products. Engineers are also traditionally more measurement oriented and are therefore more receptive to metrics programs.
- **In house education –** Coupled with the fact that most entry-level people are engineers, there is a very applied and intensive education program given to these engineers when they join the organization. In these programs they learn about quality systems, processes, etc., along with programming and technology courses. In other words, right from start they learn how process-based approach is used in software projects. (Frequently, in computer science education programs students learn programming and technology, and may not learn the principles of software engineering or learn them quite late.)
- **Cultural.** Indian culture is more family oriented rather than individualistic. This induces people to conform to established frameworks and systems.
- **Lesser resistance in getting measured.** People do not mind this much, perhaps because the perceived risks in getting measured are less. There are lesser “privacy” concerns and in-house surveys have indicated that most engineers are more concerned about the nature of work and the overall work environment, and not so much about being measured.

Management Related

- **Software people constitute the top management.** As most of the companies focus on software only, the senior management frequently consists of people who started their careers in software development. As a result, most senior management is highly aware about software processes and problems related to software. This background helps tremendously in getting the necessary backing of the senior management for the SPI initiatives.
- **Desire to move up the value chain.** As a service industry, there was a desire to move up the value chain. From the early times of providing cheap technical labor for performing lower level tasks like coding and testing only, the industry has moved to more complete life cycle

projects and is moving into consulting. This desire to move up the value chain also requires good processes, knowledge management, sharing of experience, etc.

- Early adoption of ISO. Many software organizations went in for an ISO certification early. This helped in the process-oriented approach getting established. As ISO looks at the entire organization and not just software development, adoption of ISO helped process-orientation in the entire organization. Then when the organizations decided to move to CMM, with ISO firmly in place, the task became considerably easier. Early and wide-spread adoption of ISO is probably the single biggest factor that has helped the companies move quickly to high maturity levels of the CMM.
- Involvement of top management in framework-driven SPI. In most organizations, the top management took active interest in the SPI initiatives and frequently helped monitor it. For example, in Motorola India, which was one of the first companies in the world to reach level 5 of the CMM, the CEO drove the entire initiative. Similarly, in most of the large companies like Infosys, TCS, Satyam, the CEO himself usually set goals and monitored the progress.
- Willingness to accept frameworks. Given the fact that the frameworks are based on others experience, and developed by reputed organizations, their acceptance by managers was easy and complete. The models themselves were not challenged much when they were used for SPI. How to leverage the model for the best returns is where the SPI energies went. This is a smart and very efficient way to implement model-based SPI.
- Need to prove itself. As the Indian software industry was starting from a disadvantaged position and had little respect in the start, there was a need to prove itself. This desire also helped SPI, particularly model-driven SPI, as achieving higher levels or certification in globally accepted frameworks was viewed by the management as one of the ways to prove their capability. Many software companies started small, but the management seized the opportunity to expand when subcontracting work increased and they started aspiring to become world class players. These aspirations require a world-class organization, with best processes, which, in turn, gave SPI initiatives a boost.

Conclusion

Over the last few years many Indian software companies have been assessed at level 4 or 5 of the software CMM. This dramatic shift has prompted some discussion in various quarters regarding the reasons behind it. This note examines some of the reasons, based on author's experience in working with many of the high maturity organizations in India, and inputs from various industry leaders and consultants. The factors have been grouped in three categories – people based, business related, and management related. The focus is on those factors that help SPI efforts – those factors that generally help the software industry but don't have a direct impact on SPI have not been included (thought that will also be an interesting study).

As is clear, some of the factors are based in more general and societal context. Such factors are hard to emulate once the context changes. Others are of the nature that they can be adapted and emulated in other contexts as well. Though the objective of this article was just to explain the reasons behind the success, these general reasons can be viewed as "lessons learned" as well.

It is worth noting that the Government had little role to play in this movement. Though there have been proposals, there is still no center in India along the lines of the SEI in the USA, or the European Software Engineering Institute, or the Quality Institute in Australia, or the Fraunhofer Institute in Germany. By and large, the software engineering activity in general, and the process activity in particular, has received virtually no funding from the Government. All the progress in SPI has been driven by private parties – the software industry itself and the support industry of

assessors, trainers, consultants, etc. However, there is now some collaboration with SEI on making CMM products locally available.

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