Role of Technology Integration in Mergers & Acquisitions : A Case Study from the Embedded Software Industry

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Abstract

There is a huge potential for the embedded products in the global market. Mergers & Acquisitions certainly play a significant role to meet such high-growth market segments in the global environment. This paper follows a case study approach considering the merger of two embedded software companies located in different countries. The source company was interested to buy the target company to leverage the technological integration of both the companies, enabling development of a new cost optimized product. The focus of this paper is to examine the challenges of technology management just after the merger and the subsequent impact on business financials. It also describes the strategic solutions to address these issues and the successive financial results after implementation of these strategies.

Keywords: **challenges, technology management, mergers, embedded systems, strategies**

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Technology management is the process of planning, selection, usage, and closure of technologies across relevant domains. The effective management of technology has been seen as a competitive advantage. Technology management has thus become a critical competency requirement in most organizations. Today, corporates focus not only on financials, but also take a critical view on technology to manage the bottom line and compete in the global markets. Technology management is considered to be important in order to:

(1) Have interoperable relevant technologies,
(2) Expand new features quickly and efficiently,
(3) Optimize the cost of product development,
(4) Standardize technology for specific applications,
(5) Avoid duplicity of similar research areas,
(6) Build strong business synergies in companies.

The software executed in micro-controlled based systems is called embedded software (Ebert & Salecker, 2009). The world is governed by the embedded systems through electronics and communication systems. Examples of embedded software include pacemakers, cellphones, home appliances, energy generation and distribution, satellites, and automotive components such as antilock brakes (Ebert & Jones, 2009) . Typically, embedded software teams interface with many other teams to ensure proper technology synchronization between hardware and software components. Due to the complex systems involved in the embedded-software applications, defects

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can cause life-threatening situations; delays can create huge costs, and insufficient productivity can impact entire financials. The engineers working on these products and systems should be well trained in technology, development, and validation. Ambitious new integrated product development programs require typically concurrent engineering of the various system components, making it even more complicated for the software development to capture all the relevant information on time in a merger scenario. It is not very easy to build and manage technology of integrated products with complex cross-functional environment located offices across the globe.

Modern market-driven new embedded product development projects are often characterized by ambitious time-to market goals while working in turbulent environments. Industrial development of new products faces many challenges: Intense competition, rapid technological advances, and changing customer needs and expectations. The product development must then be responsive and able to release new products in a timely fashion, yet with a good-enough quality for increased customer satisfaction. The speed of new-product development is an increasingly important success factor. Mergers and Acquisitions assist significantly in meeting the above requirements, and technology management is a significant factor in the success of a merged company to deliver the expected results.

Literature Review

Hagedoorn and Duysters (2002) demonstrated that M&As can contribute to improving the technological performance of companies in a high-tech environment. However, it has to be stressed that both the organizational and the strategic fit of the companies involved in these M&As are crucial for the technological success of M&As. It also indicated that the acquisition of high-tech companies, through which the acquiring company can improve its technological skills and expected learning capabilities, has a positive effect on the technological performance of acquiring companies after M&As have taken place. This paper also indicated that the research intensive companies create the necessary new skills and capabilities that enable the company to learn about new perspectives that can decrease its dependency on its existing environment and improve its performance. Therefore, the external acquisition of technological capabilities by means of M&As can, if proper attention is paid to the strategic and organizational fit of companies, prove to be an important strategic advantage for companies in high-tech sectors.

Sahlman (2010) indicated that in an increasingly complex economic and social environment, high technology industries are facing accelerating technological development and global technology-based competition. In these circumstances, fierce rivalry forms a challenge for enterprises on how to strategically manage the company's technology, to ensure competitive business models, value creation systems, product offering, competencies, and capabilities. Therefore, capability of strategic technology management is crucial for execution of the company's business and technology strategy for long-term business success. As a conclusion, the developed framework unites strategic management, organizational management, and technology management concepts in the context of an enterprise to enhance knowledge in strategic technology management. The contributions of this dissertation benefited practitioners by providing an outline for organizational development concerning strategic technology management.

From the study of various research papers, it is understood that technology management plays a very important role in the success of post-merger integration. There is very limited research information available specifically on post merger studies in the embedded software industry. This paper mainly focuses on a case study from the embedded software industry to present issues faced in technology integration and suggests solutions to overcome these challenges.

Overview of the Case Study

Since 1990, there has been a substantial increase in M&A activity in knowledge-based industries. Acquisitions in

computer hardware and software, electronics, telecommunications, biotechnology, and pharmaceuticals dominate much of this activity. These industries are frequently among the top 10 most active merger and acquisition industries. Such mergers and acquisitions are often focused on obtaining technical expertise, skills of employees, and specific new technologies in fast-paced industries (Rumyantseva, Gurgul, & Enkel, 2002).

In the present case study, two embedded software organizations (name changed - SourceSoft & TargetSoft) having offices in two different countries were considered. This study was conducted during the period of January, 2010 to December 2012. Prior to its merger, SourceSoft was involved in consumer product design, and was following one set of technologies, tools, and workflows ; the other organization - TargetSoft was involved in media product design having a different set of technologies, tools, and workflows. Prior to the merger, both the companies had their independent product lines targeted for some of the common customers who needed both these products into their integrated product design. SourceSoft analyzed the products developed by TargetSoft and decided to acquire the company to leverage the technical capabilities to develop a unified single product (CombiSoft) which will optimize the overall product cost for the end customer.

Keeping this in mind, SourceSoft acquired TargetSoft, though both the companies were following a few common and a few varied processes and tools. The biggest challenge SourceSoft faced after the merger was how to integrate two distinct technological products under a single product as both the teams needed to understand the technical know-how of the other product. After acquisition, the merged company initiated the development of a combined product named CombiSoft-1. The management team of SourceSoft observed certain challenges while developing the first unified product and also found that the financial results were not as expected during the year. Hence, the management team analyzed the issues and proposed workable strategies to revamp the situation before the development of the next combined product. SourceSoft implemented the suggested strategies and achieved significant improvements in the second combined product named CombiSoft-2 and noticed improvement in its financials.

Objectives and Scope of the Study

The objectives of this paper are to :

(1) Analyze the impact and understanding the importance of technology management after the merger of two highly technological companies.

Table 1. Profit and Loss Data for the Year 2010

Description	Amount - US$, 000	
	Actual	Target
Sales Turnover	2000	2750
Cost of Sales	1200	1100
Gross Profit / Loss	**800**	**1650**
Admin Overheads	50	50
Sales Expenses	80	70
Depreciation	70	70
Operating Profit / Loss	**600**	**1460**
Less Interest	30	30
Net Profit / Loss Before Tax	**570**	**1430**
Tax	285	715
Net Profit / Loss After Tax	**285**	**715**
Dividends	0	0
Retained Profit	**285**	**715**

Table 2. Efforts for Development of CombiSoft-1 Product

Stage	Task Details (Duration in Months)		
	Task	Actual Duration	Expected Duration
1	Defining the requirements	1	1
2	Architect the product	2	2
3	Design software components	3	2
4	Develop the source code	5	4
5	Integrate developed units	2	1
6	Validate the functionality	2	2
7	Deploy on target hardware	2	1
8	Supply the product to market	1	1
	Total Duration	**18**	**14**

(2) State the derived benefits of implementing strategic solutions to bring both the organizations onto a unified technology platform.

The scope of this paper includes:
(1) Analyzing the issues pertaining to proper technology management,
(2) Listing strategic solutions implemented to address issues and challenges,
(3) Looking at derived benefits after implementing the outlined strategies.

Review and Analysis

The executive team of SourceSoft collected the financial data for the year 2010 and observed a significant low performance when compared with the targeted values. The target values were set by the management team at the beginning of the year 2010 based on the discussions with the leadership team, the company's historical sales data, and market situation during the period. The details of the financials are presented in the Table 1. The executive team also collected the project execution data from the engineering team after schedule impact on development of the first unified product CombiSoft-1. The effort data is indicated in the Table 2.

From the review and analysis of Table 2, the executive team observed that the actual cycle time (18 months) required to develop a product was more than the anticipated value of 14 months. This is mainly because of lot of redundant work was developed by the teams. The cycle time increased as both the teams were working as two different organizations despite working under a single umbrella of the merged organization and also due to lack of the technology management process soon after the merger. This overrun of schedule missed the market window and resulted in loss of revenues and margins. It was also observed that the two groups were following their own sets of methodologies and there was a strong resistance in the beginning for sharing knowledge between the two teams. The merged company did not really benefit from improved financials after the merger. The executive team also observed that the share price dropped, operating expenses increased, debts accumulated, and revenues and margins declined.

Issues and Challenges

In a typical merger scenario, the merged company faced a lot of issues and challenges just after the merger. These issues were related to business, strategy, marketing, people, finance, technology and operations, and so forth. However, this paper is focused on covering the issues and challenges related to technology management and the consequent financial situation after the merger. The following were the few challenges observed in technology management after merger in this case study:

(1) There was no adequate documentation available in both the companies to have an easy reference of technology developed by the other.

(2) The teams were spread across global locations in both the companies, and it was very challenging to bring the teams onto common technology platforms.

(3) The key technical teams were engaged in development of their functional areas and had very limited or no time to spend on training and developing their skills for other functional teams.

(4) The teams were using some common tools and processes and also used a few varied tools and processes. It was a challenge to convince the teams to drop some of the varied tools and processes to adopt common artifacts.

Proposed Options

From the analysis of data, it was clearly understood that the merged company was not really leveraging the technology of the other company to offer differentiated products in the market to address the competition. Based on the above analysis, the management team asked both the technical team leaders in the respective functional areas to arrange a common meeting to discuss and rewrite the strategies:

(1) To leverage technical capabilities of both the teams to come out with an innovative product.
(2) To share knowledge between groups without impacting the regular product development assignments.
(3) To avoid redundancy in development of common components which were available in both the teams.
(4) To standardize common processes, use common tools, and follow a unique delivery model to develop a product with combined technologies.

Based on concerted meetings with senior technical leaders from both the teams, the management team proposed a few options to overcome the technology management issues and challenges :

➲ **Option-1 :** Run both the organizations as two separate strategic business units working for a unified product in their functional areas and maintain a common technology repository for the IPs (intellectual property). However, this model might not work well due to ownership issue of IPs, resolutions of any issues in IPs, and technological maintenance of IPs. More specifically, this option would not work well in developing a unified product.

➲ **Option-2 :** Form a new technology group which is common for the strategic business units who will take care of all IPs, which are required to develop a unified product and also represent a single team which can manage all the tools, processes, methodologies, and procedures required for both the business units. Still, this option was not good enough to address the basic problem of technological integration of both the products to develop new unified products efficiently to differentiate in the market.

➲ **Option-3 :** Re-organize the two business units into a single unit along with the respective technical groups and assign a competitive leader to manage the overall unit. Also, combine business units from unified marketing perspectives to understand the customer's common requirements and address the same appropriately using technologies from both the teams.

The executive team reviewed alternative options and defined few workable strategies around Option-3 as described below to address the issues and challenges in technology management.

Strategies Implemented

After a thorough analysis, the management team formulated a few strategies to address the issues with technology

integration and knowledge sharing. The executive management team created a core team (task force) of six members from both the organizations to drive technology management for implementation of Option-3. This team studied the overall issues and implemented the following strategies:

(1) Modified the Organizational Structure to Align New Products: Just after the merger, the functional groups (architecture, design, development, integration, verification, and deployment) from both the companies were working independently for their respective products. The core group merged the functional teams of both the companies to have a single functional group across the merged organization to develop unified products efficiently. They nominated suitable leaders for each of these technical groups from one of the merged companies. This strategy helped the teams to work cohesively and minimized any duplicate work as the technical groups of both the organizations were combined and were working under a common leader.

(2) Allocated Time and Budget for Technical Trainings: Knowledge management plays an important role in the success of organizational integration. The core group identified technological trainings required for various groups and defined training plans for respective domain areas at the global level. These trainings were conducted at various geographical regions for the combined technical teams to meet the technological needs and share their experiences. The core team also arranged cultural and leadership trainings to ensure blending of the teams together. This strategy helped the teams to not only obtain the missing knowledge, but also build networking for future interactions while they were working on unified products.

(3) Introduced New Product Definition with Combined Technologies: The core team studied the market opportunities and understood that the merged organizations can develop a new unified product using the technologies of both the products more efficiently. The team anticipated large revenues, margins, and market cap with these new products. Keeping this in mind, the core team asked the product groups to integrate both the technologies to come out with a more efficient unified product to serve the functionality of both the products which were performing independently earlier. This strategy not only aligned the technological teams, but also optimized the cost of the new product by combining technologies into a newly defined unified product without compromising on the functionality as well as efficiency.

(4) Established an R & D Group with Redundant Teams: The core team, while combining the technical groups under a single head, found some redundant teams (which are common in both the companies) which could be moved out of the combined group. The core group decided to use one of these teams to form a separate group to focus on future research work to support the combined technical groups. This strategy not only helped to integrate technology, but also enabled the R & D (Research & Development) group to focus more on upcoming technologies, which could be integrated into mainline products later.

(5) Clear Roadmap with Technological Innovations: The executive management team (CEO, CTO, Chairman, & Board of Directors) developed a well defined vision, mission, and goals to drive technological innovations and future new products with combined technologies. This strategy enabled many technical teams from both the organizations to seamlessly work together to come out with challenging and complex products, which could address the future needs of the global market.

(6)Well Defined Responsibility, Authority, and Ownership: The core team also defined well-structured responsibilities for the combined technical groups. They also allocated appropriate ownership to take key decisions to move forward quickly. This strategy enabled technical teams from both the companies to work on their respective assignments in combined groups. It also encouraged them to work cohesively as they possessed the powers and authority to take certain key decisions, which were earlier taken at a very senior level in the respective groups.

(7) Implemented Common Tools, Technologies, and Processes : The core team understood that both the teams were following some common tools, processes, and technologies and few of them were varied (for example : verification methodologies, design processes, fabrication technologies, bug tracking tools, etc.). The team then analyzed the varied items followed by both the organizations and decided to implement the common artifacts. There were a few initial complexities; however, the team adjusted to follow common artifacts later. This strategy helped the teams to obtain consistency in their approaches and made it easy for integrating technologies.

Observations

The executive team collected the effort data once again after implementation of the above-mentioned strategic solutions. The improvements in the changed situation can be ascertained from the Table 3 for CombiSoft-2 product after implementation of the technology management solutions. The core team also presented the comparative data of cycle times for CombiSoft-1 and CombiSoft-2 products (Table 4). It can be ascertained from the Table 4 that CombiSoft-2 exhibits better execution efficiencies as compared to CombiSoft-1 after implementation of the strategic solutions.

This reduction in development of cycle time helped the merged organization to release the CombiSoft-2 product as per the customer's requirements within the buying window of end users. This, in-turn, helped the organization to meet targeted revenues and business financials as indicated in the Table 5.

Table 3. Efforts for Development of CombiSoft-2 Product

Stage	Task Details (Duration in Months)		
	Task	Actual Duration	Expected Duration
1	Defining the requirements	1	1
2	Architect the product	2	2
3	Design software components	2	2
4	Develop the source code	4	4
5	Integrate developed units	1	1
6	Validate the functionality	2	2
7	Deploy on target hardware	1	1
8	Supply the product to market	1	1
	Total Duration	**14**	**14**

Table 4. Efforts for Development of CombiSoft-1 &2 Products

Stage	Task Details (Duration in Months)		
	Task	Actual Duration CombiSoft-1	Actual Duration CombiSoft-2
1	Defining the requirements	1	1
2	**Architect the product**	2	2
3	Design software components	3	2
4	Develop the source code	5	4
5	Integrate developed units	2	1
6	Validate the functionality	2	2
7	Deploy on target hardware	2	1
8	Supply the product to market	1	1
	Total Duration	**18**	**14**

Table 5. Profit & Loss Data for the Year 2012

Description	Amount - US$, 000	
	Actual	Target
Sales Turnover	3400	3500
Cost of Sales	1700	1800
Gross Profit / Loss	1700	1700
Admin Overheads	60	60
Sales Expenses	80	80
Depreciation	80	80
Operating Profit / Loss	1480	1480
Less Interest	40	40
Net Profit / Loss Before Tax	1440	1440
Tax	720	720
Net Profit / Loss After Tax	720	720
Dividends	0	0
Retained Profit	720	720

Table 6. Profit & Loss Data for the Year 2010 & 2012

Description	Amount - US$, 000	
	Actual - 2010	Actual - 2012
Sales Turnover	2000	3400
Cost of Sales	1200	1700
Gross Profit / Loss	800	1700
Admin Overheads	50	60
Sales Expenses	80	80
Depreciation	70	80
Operating Profit / Loss	600	1480
Less Interest	30	40
Net Profit / Loss Before Tax	570	1440
Taxation	285	720
Net Profit / Loss After Tax	285	720
Dividends	0	0
Retained Profit	285	720

The core team also provided the comparative financial data (Table 6) for CombiSoft-1 and CombiSoft-2 products which were marketed in 2010 and 2012 respectively. The Table 6 clearly indicates that the effective implementation of technology management after the merger helped in reducing the efforts required for each task due to efficient implementation of technologies, tools, methods, and processes from both the organizations after unifying the teams. This, in-turn, improved the financial situation of the organization.

Managerial Implications

The managerial team was busy in executing the merger process and retaining the senior technical members after

the merger. There was little focus on technology integration and monitoring the schedule to complete the product in time. This situation led to a delay in product development, and subsequently, impacted the financials. The core team observed that most of the managerial team was busy with the merger process during the year 2010. In the subsequent 2 years, the core team requested most of the senior technical leaders to focus on the resolution of technology integration issues and retaining the senior technical staff so as to not impact the product schedules. This strategy helped the organization to resolve most of the technical integration issues in the year 2011 and 2012, and the retention of the senior technical staff during this period helped the organization to meet the product completion schedules as expected.

Recommendations

From the study, it can be understood that technology management is a crucial process in the post-merger scenario. The executive team of SoftServe had to drive this activity with dedicated efforts and close controlling. A repository should be created on the server where all the knowledge artifacts can be stored and made available to the employees, as required. The executive team should also allocate budgets in financial planning for technical and professional trainings across the global teams on a regular basis. Cross cultural trainings are very important, especially during the post-merger, for the global teams to openly discuss and share their technical expertise with other teams as needed.

Conclusion

The organization faced a lot of challenges in the beginning (just after the merger) due to lack of enough focus on technology integration and knowledge sharing between the teams. Consequently, the net profit at the end of the year 2010 was US$ 285,000 as against the target value of US$ 715,000. Furthermore, the time taken to design and deliver the product was 18 weeks as against the target value of 14 weeks to complete the product. After implementing the strategies discussed in this paper, the organization delivered successful products with combined technologies. As a result, the net profit at the end of the year 2012 was US$ 720,000, which was equal to the target value of the year 2012. Also, the time taken to develop a similar product in 2012 was 14 weeks, which was as expected by the management team. The products released in the year 2012 were well received in the market, and the organization not only turned around to get into a good financial health and profit margins, but also successfully integrated technologies and teams as well.

Limitations of the Study and Scope for Future Research

This study is mainly focused on the embedded software industry and only a few factors were considered for evaluation of the results. However, the same analogy can be applied for other industries as well. There is more scope for future research in the above-mentioned areas. This study can be extended with the collection of data from 5 to 10 similar organization mergers to understand the issues in detail and verify the consistency of their occurrences. A study of more than one merger will also help to consolidate more strategic solutions to provide as guidelines for future mergers in similar organizations. This study can be further extended to financial ratio analysis to observe the financial parameters in more depth.

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