

Commercializing Technology Solutions- Moving from Products to Solutions

Anand Dass, and Hiroaki Murakami

Abstract—The paper outlines the drivers behind the movement from products to solutions in the Hi-Tech Business-to-Business markets. The paper lists out the challenges in enabling the transformation from products to solutions and also attempts to explore strategic and operational recommendations based on the authors' factual experiences with Japanese Hi-tech manufacturing organizations. Organizations in the Hi-Tech Business-to-Business markets are increasingly being compelled to move to a solutions model from the conventional products model. Despite the added complexity of solutions, successful technology commercialization can be achieved by making prudent choices in defining a relevant solutions model, by backing the solution model through appropriate organizational design, and by overhauling the new product development process and supporting infrastructure.

Keywords—Technology commercialization, Solutions, Hi-Tech companies, Japan, Management of technology

I. INTRODUCTION

MOST organizations in the complex Hi-tech products market have been pressurized to move beyond being a mere provider of products and services, in the last half a decade. There has been a marked shift towards a greater need for providing integrated solutions. While no industry has been spared of this fundamental shift in market dynamics, the effect of such changes has been profound on the Hi-tech market. Several years ago we started working with organizations in Japan that were faced with a similar dilemma of moving beyond offering products. These organizations were from various industries such as automotive, medical devices, consumer electronics, semiconductor and computing products. While the intent was right, the path to execution was fraught with strategic and operational choices that were often dichotomous and perilous. While a few organizations succeeded, others were victims of failed choices regarding the skills and competencies required to succeed, the choice of organizational design, and the constraints of their legacy and dominant mental models. This paper analyzes the drivers behind this profound change, challenges encountered while enabling the transformation, lists out examples of successful transformations, and outlines a framework for enabling this transformation.

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II. IMPERATIVES OF MOVING FROM PRODUCTS TO SOLUTIONS IN THE HI-TECH SECTOR

As product-markets mature, technologies converge, commoditization ensues and consequently there is a significant pressure on product manufacturers to transform into solution providers. Solutions are usually born when a vendor can meld a certain level of expertise with proprietary IP-a method, product or an amalgam of the two-to handle a problem for a customer or to help it complete a step in its business [1]. A significant body of research on the drivers of this compelling change is already available. However in our experience the velocity of these drivers is significantly higher in the Hi-tech market due to the network effect of technology innovation. For the purpose of this paper, Hi-tech is defined as high-tech manufacturing, communications services, and software and computer-related services. It also includes many "related" industries, such as biotechnology, engineering services, and research and testing services. The urgency of moving to solutions is driven by three key variables-Connectedness, Specialization, and the Rate of technology change as in Fig. 1.

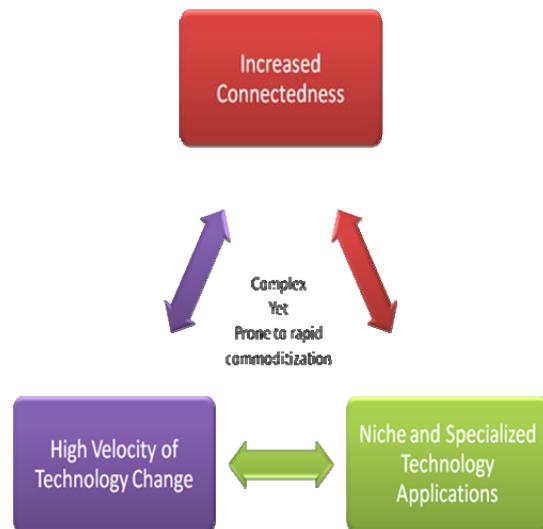


Fig. 1 The solutions imperative

The Hi-tech sector is characterized by markedly higher levels of connectedness than other industries. The advances in computing and telecommunications has enhanced connectedness in the Hi-tech industry through sensor networks, enhanced machine-to-machine communication and increased connectivity of devices to the internet. This connectedness has been ushering in digitization and intelligence to a lot of hi-tech

products that lie beyond the telecommunication and computing sectors such as manufacturing instruments, medical equipment, industrial devices, precision equipment etc.

Hi-tech products are being increasingly targeted towards niche and specialized technology applications. The one-technology-does-not-fit-all model, coupled with the increased sophistication and complexity of customer needs have in turn created a greater focus on solutions.

While all industries have witnessed changes in the underlying technologies over the last decade, the Hi-tech industry's underpinnings have continued to evolve at every level; hardware, interaction protocol and software have all evolved at break neck pace. Not only have we witnessed a change in technology generations but also often the threat of substitutes and alternatives is as much from alternate architecture choices as from new technologies. This increasing pits organizations from adjacent market segments against one another. A great example would be of Cisco that has gone the hardware route for unified communications while Microsoft has gone the software route to serve the same market [2]. This has pitted the technology giants against each other.

The Telecom, Media and Technology businesses inside the Hi-tech industry have been able to respond with alacrity and in many cases have even ignited and shaped these trends. However parts of the Hi-tech industry not originally associated with the telecommunication and computing business, such as process control instruments, laboratory apparatus have struggled to come to terms with the choices needed to make the transition.

III. CHALLENGES OF THE JAPANESE HI-TECH SECTOR IN MOVING TO SOLUTIONS

Japan has a strong track record in the Hi-tech market. The fundamental driver of Japan's Hi-Tech growth has been the international competitiveness of its hardware sector. Japanese Hi-Tech businesses have also benefitted time to time from the various initiatives of the Ministry of the Economy, Trade and Industry [3].

However, over the course of the last decade Japan has struggled to stay competitive in an increasingly interconnected, flat world [4]. In the course of our work we have observed that Japanese organizations are faced with four major challenges as in Fig. 2



Fig. 2 Challenges for Japanese Organizations

The Burden of the Manufacturing Legacy

Much of Japanese organizations' success has been founded on manufacturing excellence. Miniaturization, automation and precision have marked the competitive advantage of Japanese organizations. In the solutions world where value often comes from software, from intangibles such as process and from the melding of various disparate systems, the skill sets needed to succeed are vastly different from the manufacturing mindset of "*Monozukuri*-the art of making things". The legacy of the manufacturing mindset clouds managerial decision making when it comes to solutions creation. Though organizations tend to have robust product manufacturing systems and associated governance objectives, we observed that the organization structure, key metrics of performance, research and development process and decision making guidelines have been weak and rather biased towards a product centric approach. We also observed that the process and the criteria concerning mergers & acquisition and the discontinuation of a new product were inadequately defined. Organizations have also been observed to struggle with decisions around what core technology had to be developed in-house versus what ancillary technologies needed for solution building ought to have been sourced from outside. The struggle is accentuated by the fact that core competency for providing products to market are not necessarily core competencies for taking solutions to market.

The impressive rise of manufacturing companies in developing countries, such as China, has only served to compound the troubles for Japanese Hi-Tech manufacturers. These low cost manufacturers who make products much cheaper than Japanese companies are locked in a race to the bottom, driving the price premiums of Japanese manufacturers southwards.

As debatable as it maybe, the Stan-Shih curve (Fig. 3) is an intuitive representation of how the value from mere manufactured products continues to fall [5].

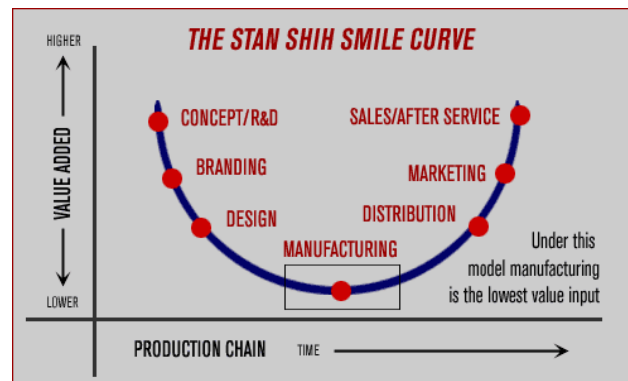


Fig. 3 Stan-Shih Smile Curve

Lack of Economies of Scope in Global Markets

Though Japan exported about US\$ 677 billion (2007) worth of goods into the international trade marketplace, its influence on shaping the market spaces it operates in appears to be incommensurate. We observed that business with visibility to, influence over or control of the value chain often find it easier to build a solutions approach. With the exception of a few

sectors like automobile, consumer electronics, Japanese business have taken an **OEM or component provider approach**. This makes visualizing and controlling the value chain inherently difficult and consequently Japanese enterprises have had to work harder to envision solutions.

Cultural and linguistic barriers for most Japanese organization are high when operating in international markets and there is a tacit belief that the domestic market is an easier market to go after. However product requirements, user needs, market dynamics, go-to-market approaches and commercialization economics that work in Japan fail to replicate and scale in international markets. Consequently Japanese businesses tend to get cut off from global markets and this limits their ability to create economies of scope.

Suboptimal Product Management and Marketing Organizations

One notable characteristic of the Japanese economy has been how manufacturers, suppliers, and distributors have worked together in closely-knit groups called keiretsu. The flow of information, data and insights in this closely knit system is invaluable. The existence of such an informal feedback loop might have been a contributing factor to the lack of development of a formal market assessment methodology. The absence of such a support system might be one reason why Japanese businesses struggle to compete on solutions when competing in international markets. When dealing with information and analysis, culturally, Japan appears to place more value on the **form over the function** of the information and the depth of analysis over the summary of strategic recommendations from the analysis. In our experience, an ability to see the larger picture, abstracting the level of details and dealing with ambiguity appear to be essential ingredients in building solutions.

The interaction of these three variables leads to what we call the **solution myopia where the organization takes a product centric, competition focused approach rather than a problem solving, market need based approach** as expressed in Fig. 4.

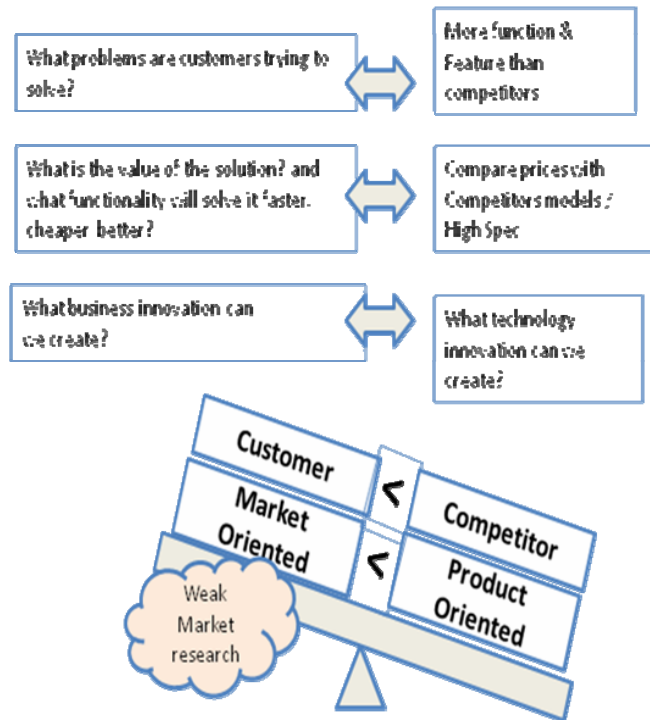


Fig. 4 Product centric, competition focused approach versus client centric, problem solving approach

III. EXECUTING THE JOURNEY TOWARDS SOLUTIONS-THE FOUR INGREDIENTS OF TRANSFORMATION

Commercializing solutions in the Hi-tech market is a journey fraught with several strategic and operational risks but for organizations with a clear understanding of the complexities involved, the risks can be mitigated.

As in Fig. 5 we have observed four key elements for a successful solutions transformation initiative

1. Definition of a solutions model for technology commercialization
2. Organization design choices
3. New Product development and go-to-market process overhaul
4. Platforms for supporting ideation and solution build out.



Fig. 5 The four ingredients of transformation

IV. DEFINING A SOLUTIONS FRAMEWORK

Based on past experience, we observed that the trick to moving from a product centric approach to a solutions approach lies in “*Metanoia*”-shift of the mind and a “systems thinking” approach to solving unique customer problems. Organizations should focus on using technical and business tools available at their disposal to create unique solutions to specific problems.

As in Fig. 6, broadly a solution has three layers; **the intimacy layer, the intermediation layer and the delivery layer**. The model is not set up to represent the innermost layer as the most important element. While all layers are equally significant, traditional hi-tech product organizations have focused on the delivery layer as their core offering. The genesis of a solution lies in customer intimacy and the definition of value to the customer emerges from such intimacy. Intimacy is defined as the existence of a **trusted advisor relationship between the customer and the vendor, built on the demonstration of insight, subject matter expertise and advisory potential** of the vendor. The vendor should also possess a unique methodology or a concept approach to solving the customer problem. As all markets are conversations [6], the vendors ability to have peer conversations with multiple stakeholders inside customer organizations is critical. Operating at this layer requires a consultative approach to selling and strong account management skills.

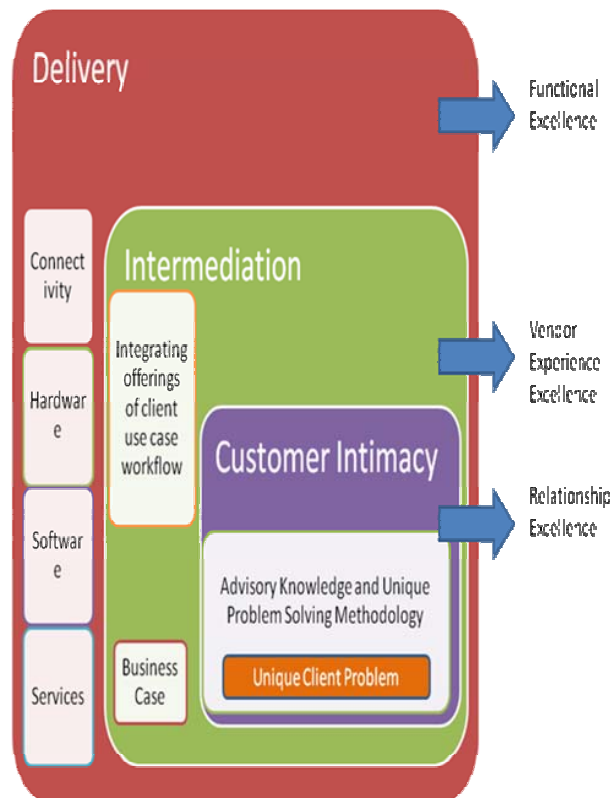


Fig. 6 The solutions framework

Wrapped around this intimacy layer is the intermediation layer that connects the solution delivery mechanisms and the solution itself. **The Intermediation layer comprises of the workflow integration and business case components.** The focus of the workflow integration module is to ensure that the solution can be seamlessly integrated with the as-is workflow of the customer. Sometimes this may entail taking a business process reengineering approach to adapt the process to the solution. In any case, organizations will fail to live up to the solutions promise unless they ascertain the customers’ use case landscape, interacting systems and ascertain ways of integrating, and influencing the interactions between these systems. Quite often hard decisions will have to be taken around picking best of the breed solutions and integrating them instead of using home grown modules.

The other significant component of the intermediation layer is the business case. In the course of the solutions conceptualization, design, sale and deployment stages of the lifecycle, organizations must actively seek out ways to baseline, set target efficiency increases, define target cost take outs or revenue generation goals in the customer context. This financial modeling should be tied into the pricing and business model formulation based on the customer and vendor motivations. Needless to say, deal structures such as risk reward models are as much a part of the solution as are the technical offerings or workflow components. The business case modeling conversation gains further importance when we consider that often the solutions are unique answers to unique problems. Such solutions often carry return on investment

models that are difficult to fit into the conventional pricing models followed by organizations.

Finally, the solutions **delivery layer comprises of the necessary delivery mechanisms of hardware products, software products, connectivity components and services to train, install, service, maintain, or even run the solution** for the customer. The traditional product centric approach has always focused on this layer. The delivery layer is rapidly prone to commoditization in the absence of the other layers. The effectiveness of a solutions strategy can be judged by its impact on the premium chargeable by the organization.

A great example of a solutions led approach is the Applied Materials' (AMAT) Sunfab line of solutions. AMAT's solution is targeted at reducing the solar power generation costs to around US\$ 1 per watt. With lower costs, solar power adoption is expected to take-off which will further enable cost effective and clean power generation, distribution and consumption solutions. AMAT has clearly laid out ROI calculations on why and how its technology reduces the cost of producing solar panels. This AMAT solution not only just offers the thin film manufacturing equipment but also ties into the thin film solar panel production workflow by offering a turnkey factor line. AMAT'S customers are of course tasked with running the operations of the plant once it is set up. AMAT is also reported to participate in deal structuring for these large capital outlay products so that financial barriers to adoption is minimized. [7]

V. ORGANIZATIONAL DESIGN CHOICES

Many technology organizations fail to realize that moving to a solutions model places extreme demands on the organizational structure needed to support and sustain these solutions. Conventionally product centric organizations are organized along a functional model where marketing, sales, product engineering, corporate R&D and support operations operate as independent operations with a linear flow of information and products up and down the value chain.

Solutions add pressure to the system because of the level of customization involved and the degree of integration needed to realize a solution. This extracts tremendous coordination needs from the players with-in the system. Solutions will require the agility of a start up organization and the resources of a large organization. Therein lay the dichotomy. The ability to design an organization that can incubate pilot solutions for one customer and then replicate and spawn them across multiple customers with a fair degree of customization is critical. We observed that solutions roll out and sustenance is well served when functional or divisional structures are replaced with a competency based structure that is aligned to the solutions framework adopted by the organization. The objective behind such organization design should be to increase physical and relational proximity to the customer's businesses.

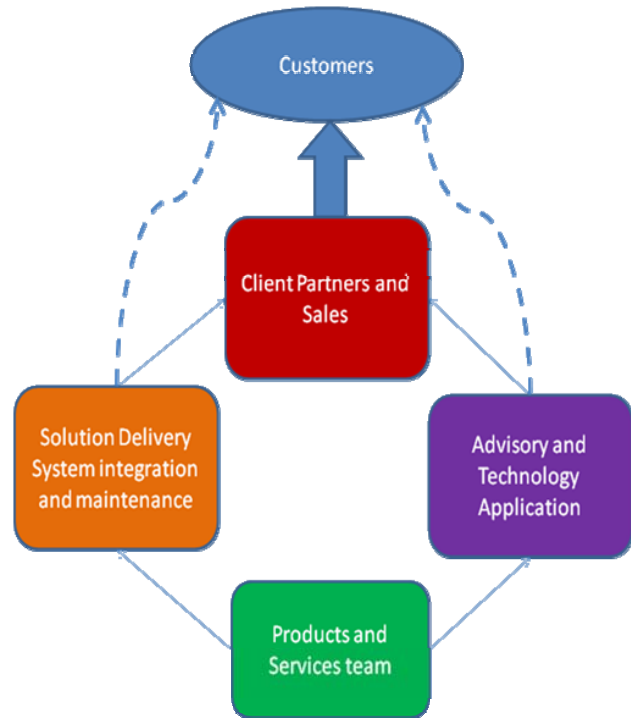


Fig. 7 Organizational design example

As in Fig. 7 operating at the intimacy and intermediation layers would need building **new competencies such as advisory services and consulting services** which focus on conceptual selling. The people that staff this function might have to be acquired from the customer's industry. The advisory team would have to be staffed with application experts, business and technical consultants.

Client partners and sales team function as system orchestrators who work very closely with the customers for need discovery and at the same time pull together resources from within the organization and from best of breed partners from outside to be able to deliver a comprehensive solution for the customer problem. The buyer profile in solutions sales has been observed to be at a line of business/CXO level as opposed to the buyer level in case of product sales. This certainly has implications on the profile of people hired into the team. Due to multiple internal teams involved in solutions definition, it might become imperative to provide incentives to all business units involved not just to the one that owns the customer. Solutions sales make sales planning difficult, and the sales cycle complex. Organizations have had to invest significant resources into training and re-skilling product salesmen.

With the increasing trend of digitization and networking of systems in the Hi-Tech market, operating at solution delivery would need a **solutions delivery unit that functions as a systems integration and solution deployment team. This organization acts as the internal customer to the product and services team.** This group shall also be the team that helps spin out replicable solutions across the organization.

The product and services team would focus on building out the basic blocks of the product, service, and infrastructure and would own the implementation of the

technology roadmap. As organizations begin the transformation to solutions, conventional R&D organizations have been observed to morph into the product and services team. Management will most certainly face motivation issues during the transformation as the products team begins perceiving a loss of power and control over the technology destiny of the organization.

One of the best practices that have been observed in successful organizations is rotation of the personnel across these various teams. Not only does it provide greater learning opportunities for personnel and serves to heighten morale, it also enables each entity in the system to appreciate the complexity of each other's roles. Often this has helped in increased teaming between all parties involved.

VI. PROCESS DESIGN AND PLATFORMS

At the heart of commercializing technology solutions is customer intimacy. Organizations have to hone customer intimacy skills to the point that it becomes its core competency. At the core of intimacy lies a set of customer centric process that enable **all stake holders mentioned in the organizational design to see, hear, feel and analyze the market trends and needs of individual customers.** Whereas the utilization of "moments of truth" have become fairly commonplace in the business-to-consumer and in the Hi-tech consumer electronics and automobile businesses, the ways and means to capture, decipher, assimilate, decide and act on the voice of customer has found to been lacking in the Hi-tech Business-to-Business space. While the conventional Segmentation, Targeting and Positioning model of marketing and the 4P model of Price, Promotion, Placement and Product contribute to decision making, commercialization of technology needs other bottom up elements for success as in Fig. 8.

Successful solutions generation processes have a robust element of market research that enables capture voice of customer and market trends through market sensing and in-depth expert insight. This in turn feeds into a tools driven, analytical process around strategy, conceptualization, solution development and engineering. Often solutions cannot be conceptualized in the absence of ideas, associated technologies and services provided by complementary partners. Successful solutions' initiatives have a mature and thriving alliance component.

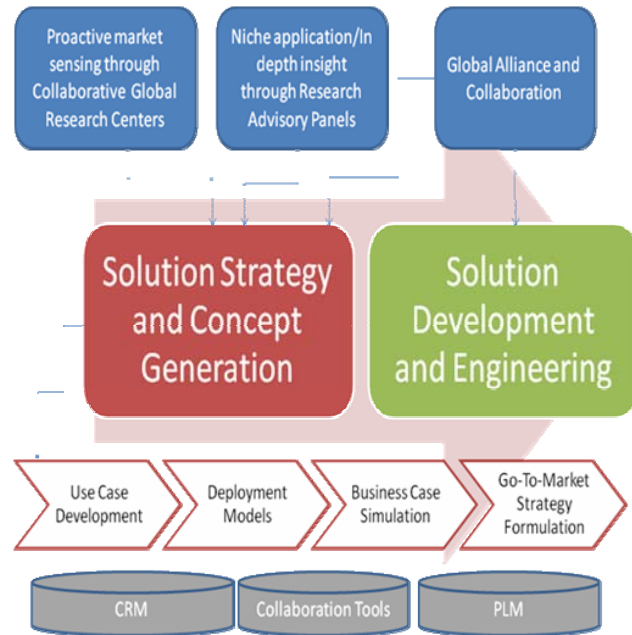


Fig. 8 Process and platform model

Technology commercialization through solutions, by definition, is heavily dependent on an organization's ability to sense the market at a macro and a micro level. The sources of inputs can be several. Conventional product firms track syndicated secondary research and undertake reactive custom research when product development planning gets underway. However, in the case of solutions, customer intimacy, insights and advisory knowledge comes from an organization's ability to invest and proactively sense market and technology trends. Furthermore, with greater granularity in segmentation [N=1] [8], there is a need for deeper understanding of customer needs. The data and analytics available through this exercise helps the client partner and advisory team take proactive solutions to client problems.

The model for proactive market sensing comprises of two key components; collaborative global research centers and research advisory panels.

The global research center (GRC) augments the client marketing organization by taking on structured marketing and product management tasks. Often companies do not have the wherewithal and resources to extensively cover the global marketplace and hence adopting a collaborative approach with a research firm acts as a force multiplier in sensing market data. Organizations will benefit from the collaboration with a global research firm that sources knowledge and product planning inputs for solutions initiatives. This helps the customers' own resources focus on more value adding activities such as decision making and planning based on the information. A typical GRC workflow is described in Fig. 9



Fig. 9 Typical GRC workflow model

While the GRC helps businesses sense markets at a macro level, the research advisory panels (RAP) enables sense customer needs at a micro level. RAP is a panel of specialists, with subject matter experience and deep domain knowledge in specific market segments. We observed that there is tremendous value in engaging these experts to validate the solutions strategy and the viability of the concepts. Usually RAP members are leading industry practitioners who can guide, coach and mentor organizations that plan to build specialized solutions.

An organization embarking on a solutions journey should **reexamine its solutions generation process and ensure that structured voice of customer inputs are collected, incorporated in the strategic planning and acted upon.** This might require some business process reengineering which is well worth the investment. We have also observed that one element that has been absent in planning exercises is the formal structuring of use cases. Whereas engineering teams in Hi-tech firms have been fairly focused on developing technical use cases with actors, roles and interaction scenarios, the use cases for the **business viability of the solutions** have been historically overlooked. The use cases at this stage focus on defining the precise pain point, how the solution fits into solving the pain point, and related user activities and business process that the solution interfaces with.

Assessing **deployment models** involves understanding the **missing pieces in the solution**, the pieces that the organization does not possess in-house, the organization's ability to successfully put together a solution, and the channel strategy for servicing the customer.

Business case simulation involves testing the business potential of a solution before the presales phase of the solution sales happens. Organizations with robust solutions development process undertake **financial modeling of the proposed solution.** Such financial modeling is usually done right after the identification of the benefit categories of the proposed solution. The hypothesis around the cost versus benefits is validated through market research and the

customer's potential return on investment from adopting the solution is ascertained. Assessing this early on in the solutions creation cycle serves as a litmus test for whether the solution holds promise.

Go-to-market strategy involves defining the necessary **variables that will feed into the product requirements documents.** The more incremental the solution, the easier it is to map customer needs to technological requirements using tools such as choice models, perceptual mapping, conjoint models, surveying perceptions and preferences. The more the solution is breakthrough, the less the firm understands the mapping between technology and market success. In such cases typical research techniques include vision validation discussions, lead user analysis, customer ethnography, empathic design, evolving prototyping and customer advisory panels.

The solutions strategy invariably requires the vendor to assemble a myriad of solution components in order to build a solution that solves the customer's problems. From our past research we have identified the capabilities and expertise that organizations expect from global partners in order to achieve successful solution development. These expectations are centered around technical leadership, intellectual property, process leadership, on demand scalability, market context and knowledge, and supply chain knowledge. [9] **These goals from collaboration can be defined through the 3 C's framework in Fig. 10**

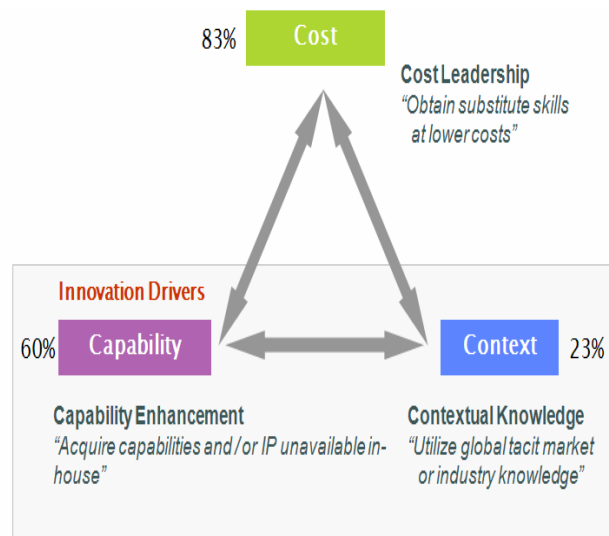


Fig. 10 The 3 C framework for Global Collaboration

Organizations must make long-term investments to develop collaborative capabilities. From past research we have identified that such capability rests on the four P's that organizations must manage; **people, platforms, projects, and programs.** Organizations seeking collaborative solutions building will be unsuccessful unless they invest resources in learning and building specific skills in people, collaborative platforms that enable sharing IP and tools, collaborative new product development process, and cohesive program governance policies.

Finally, the capability of building solutions rests on support infrastructure that enable **content sharing, joint ideation, real time simulation, mock up of concepts and other tools that enable real time sharing of information and insights between the customer, the vendor and potential partners.** Advances in Information Life Cycle management tools such as Customer Relationship Management tools, Product Lifecycle Management tools have facilitated recording, storing and running analytics on much needed customer intimacy information. Recent advances in communications such as unified communication, web 2.0 technologies such as wiki's and blogs and cloud computing are expected to help provide faster, better and stronger platforms which can propel customer centricity to new levels.

VII. CASE STUDY

A leading Japanese Hi-tech equipment manufacturer X (the "client") had enjoyed a significant share as a device provider in a stable international market for several years. However, the market scenario had started changing due to the entry of world class electronic manufacturers in this market. These new entrants positioned themselves as "solution providers" with digital technology and with complementary information technology solutions.

As with many traditional Japanese Hi-tech manufacturers, the client had been focused on providing complex feature functionality & high performance products led by the Research and Development (R&D) team. As the market landscape reshaped, the client faced difficulty in correctly capturing the shift in the global market environment and could not introduce attractive enough new products and services into market in a timely manner.

We observed the root cause of the problem to be a weak marketing and product planning process. To solve the client problems described above, market research was conducted to analyze the dynamics of the market and to gather the market requirements. At the same time, the clients' internal product planning processes were reexamined.

The client processes appeared focused only on comparing their product's functionalities with those of their competitors' products.

The market research results and restructured planning process generated significant positive impacts on the client's solution creation competencies. The client successfully generated concepts for their flagship model product in less than half the time it took previously, powered by clear market requirements and optimized activity process maps. The client founded a new business department which intends to provide solutions to the market rather than just provide products.

VIII. CONCLUSION

The transformation from products to solutions is likely to be a journey rather than destination. This current body of research is but a glimpse into what we believe is a decisive strategic shift in the way businesses produce and consumer value. With the economic meltdown and the recession looming ahead, businesses will be forced to rapidly and creatively add value to clients. The quest to remain valuable and relevant will accelerate the journey from products to solutions across all

industries. We hope to continue our research with a larger sample set of businesses across several other industries with the goal of finding patterns that will help us formulate deeper insights for helping business along their transformation journey from being product companies to solution providers.

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