

INNOVATION IN LARGE COMPANIES: APPROACHES AND ORGANIZATIONAL ARCHITECTURE

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INTRODUCTION

This chapter provides an overview of the overall approaches and organizational architecture for innovation in large corporations. An overall typology for how companies approach innovation is indicated in figure 1. On the ordinate is the focus of the innovation effort – which may be internal or external. Internal innovation effort refers to the development of products or services which grow the current businesses. External innovation is used to imply innovation efforts which are occurring in other companies and because of their synergy become prime candidates for acquisitions, mergers, alliances and co-development. The term is also used in the context of a product or service innovation developed for a new business external to the corporation. An example of this would be the development of a “spin-off” company, such as Face2Face, which has unique applications in facial analysis and animation built on technologies developed by Lucent – but which does not fit with any of Lucent’s current businesses. On the abscissa is the funding – whether it is from a Strategic Business Unit (SBU) or corporate. Organizational structures for new product development will be explored in 3 of the areas. Mergers and acquisitions, joint alliances and co-development activities (top left hand box) are not discussed in this chapter.

<insert figure 1>

PRODUCT DEVELOPMENT WITHIN A STRATEGIC BUSINESS UNIT – bottom left corner.

The majority of product development within most corporations occurs within a SBU – which is responsible for their profit and loss and is aligned with industries and has a well defined value chain and customer distribution channel. Figure 2 illustrates an overall architecture for managing innovation. This section begins with a discussion of different parts of the architecture and ends by indicating the constituencies needed to manage the overall process.

Innovation Vision

The process begins with an innovation vision which is consistent with the SBU strategy. A good example is the innovation vision which led to the development of the HP ink jet printer. In the mid-1980's HP's dot-matrix printer was being eroded by two market forces. The emergence of laser printers, while more expensive, offered higher quality printing, and were taking market share at the high end. Less expensive dot-matrix printers were emerging, which were reducing market share and margins in the low end. As a result HP, in September 1985, developed, an innovation vision, for the printing SBU to develop products with print quality closer to laser printer, but at a price that would compete directly with the lower priced dot-matrix printers. Another example is how Sony created the first "walkman" by setting a seemingly impossible vision in 1952 of a "pocketable radio" – at a time when transistors were only being used in military applications. Still another example is the innovation vision developed by Kodak which was to expand their product line to a one time use disposable camera where the film would be packaged in an inexpensive plastic case which the consumer would return directly to the photofinisher. This innovation vision ultimately resulted in the development of Kodak's very successful FunSaver camera. Ultimately the innovation vision will need to capture not only the new platforms – as discussed above - but also innovations needed to sustain the current business as well as visions for radical or breakthrough projects.

<Insert figure 2>

The overall innovation vision is bounded by 5 forces, as illustrated in figure 2:

Overall SBU Strategy. The overall strategy defines the mission, value chain and market channels of the SBU. The innovation vision needs to be consistent with the SBU strategy. Although in some cases the SBU strategy may need to change. For example, when a new market channel is envisioned with an existing product.

Core Competencies and Capabilities. Competitive advantage is achieved when a company has unique core competencies (Prahalad and Hamel, 1990) and capabilities (Stalk, et. al. 1992) that are valuable, rare, immutable and nonsubstitutable. Competencies are a unique set of skills which provide significant competitive advantage to the corporation. For example, Honda's expertise in engines can be considered to be a core competence (Prahalad and Hamel, 1990). In contrast, capabilities are a bundle of skills embodied throughout the corporation that allow it to achieve competitive advantage – where no single skill represents a competence. An example is "cross-docking" (Stalk, et. al. 1992) which is a capability that Wal-Mart possesses that allows them to continuously deliver full truck loads of goods to central

warehouses where they are repacked and dispatched to stores without ever sitting in inventory. This sophisticated inventory system is supported by a private satellite communication system that daily sends point-of-sale reports to its 4000 vendors and transportation system which includes 19 distribution centers supported by 2,000 Walt Mart owned company trucks. In this way Wal-Mart is simultaneously able to minimize overall inventory and product cost, while maximizing inventory turns at their stores.

Market Trends. The innovation vision needs to be consistent with the current and future market trends and unmet customer needs.

Competitive Forces. Understanding of the competitive landscape is also critical as many competitors are vying for the same or similar product landscape. Intellectual property developed by competitors may block the company's ability to develop products built on an already patented technology.

Financial or Economic Goals. One of the goals of the innovation vision is to achieve the revenue growth and profitability within the investment parameters of the SBU. Many companies fail to test whether their innovation vision will achieve their financial objectives.

Product development needs to begin with a well defined innovation vision, which leads to an innovation strategy, which in turn defines the product and platform strategy.

Innovation Strategy and Portfolio

An innovation strategy is then developed based on the innovation vision. The innovation strategy expresses the products and services which are needed to meet the innovation vision. This strategy is "operationalized" into a product portfolio. Ultimately it is a senior management responsibility to determine project selection and resource allocation. Cooper, et. al., (2001) classic book on portfolios and Chapter XXX¹ are suggested for readers who are not knowledgeable on the subject. The overall purpose of a portfolio is to:

Maximize Value. What projects will maximize the overall return based on the business objective of short or long term profitability, return on investment, economic value or strategic objective?

¹ Note to editor: Insert the Portfolio Chapter number.

Achieve Project Balance. Effective portfolio management will achieve balance between long term and short term, high vs. low risk and project types (i.e. maintenance and fixes, cost improvements, incremental, platform and radical products.)

Assure Strategic Alignment. The main goal of the portfolio is to achieve strategic alignment with the innovation strategy so that all projects are “on strategy.”

Choose the Right Projects. Ultimately most companies have too many projects. The overriding goal of effective portfolio management is to balance projects and resources.

Platform and Product Strategy

The innovation strategy determines both a platform and product strategy. Platform products (Meyer and Lehnerd, 1997) establish a basic architecture for a next generation product or process and are substantially larger in scope and resources than incremental projects. An example of a platform product would be HP’s Deskjet printer. The first Deskjet printer established overall technology and manufacturing architecture. Incremental extensions include the Deskjet plus which offered cost and quality improvement followed by the Deskjet 500C which enabled color printing. Dual cartridges, one for black and one for color, were added to the Deskjet 550C. Portable printing were part of the Deskjet 300 version. The 600 platform was an entirely new design built around a new core patented ink technology which could produce deeper blacks and more vivid colors. The new ink affected the entire platform architecture including the mechanical subsystems and required a complete rework of the electronics. Both the platform and product strategies for inkjet printers are illustrated in figures 3 and 4.

<insert figure 3>

<insert figure 4>

The platform strategy leverages the core competencies and capabilities of the company and defines the overall aggregate project plan and resources needed. This information is then feed back to the innovation strategy, since adequate resources are not available to staff all of the projects. The innovation strategy is then modified and continuously refined so that resources match the portfolio, platform and product strategies (see figure 2).

Companies which develop platforms which are built on the core competencies and capabilities of the firm typically achieve a greater return from their investment than those which primarily focus on incremental products built on continuing extensions of their existing products.

Stage-Gate[®] and Technology Road Mapping

Another part of the innovation architecture is the management of individual projects. These are typically managed by a “Stage-Gate[®]”² (See Chapter XXX³) process. A schematic of the “typical” five stage five gate model is shown in figure 2. Each project is assessed at each gate with the results compared with other projects during a project portfolio assessment.

The technology road map is also considered to be a critical element of the product development architecture since it provides a road map into the future. Technology is related not only to time, but linked directly to the product strategy. An example of a technology roadmap for the Motorola cell phone is shown in figure 5. An excellent series of articles on Technology Roadmapping is contained in a recent issue of Research-Technology Management (Albright, et. al., 2003)

<insert figure 5>

Constituencies for Managing the Process

The overall product development process as outlined in figure 2 is managed by 5 different constituents:

- Senior Management. Senior management (i.e. SBU President, Vice Presidents of R&D, Marketing, Finance and Operations) is responsible for determining the innovation vision, platform and product strategy and utilizes the portfolio to determine if their strategy is on plan. They often serve as gatekeepers in the Stage-Gate[®] process from the Business Case Gate – typically Gate 3 - until commercialization. In this role the gatekeepers have the responsibility to approve and allocate resources to projects in development. In some cases Gate 1, the idea screen, and Gate 2, the scoping screen, are the responsibility of a R&D/marketing planning team. The senior management role as a gate keeper has

² Stage-Gate[®] is a registered trademark of the Product Development Institute, Inc.

³ Note to editor: Need to add the reference for the chapter on Stage Gate.

wide diversity in companies. Though it is generally accepted that they need to be part of the decision making process for large platform and breakthrough projects.

- R&D Management. R&D Management in both the SBU as well as the corporate research laboratory are responsible for the technology road map, developing, licensing or acquiring the technologies contained in the road map.
- Process Owner. A process owner is critical for managing the overall product development process. He or she facilitates and acts as a coach/mentor to teams and assures that the overall process is running efficiently. Having a full time process owner is critical in most companies. Cooper (2001, pg. 348) indicates that "...there has never been a successful installation of a Stage-Gate® process without a process manager..."
- Portfolio Manager. A number of companies have a portfolio manager who helps evaluate the project portfolio and keeps information current and accurate on the multiple projects being worked on by the company. In some companies the process owner also plays the role of the portfolio manager.
- Product Line Planning Team. Meyer and Mugge (2001) indicate that IBM has staffed a specialized team to plan and determine the future platforms. Collectively they evaluate the company's competencies, capabilities, common architectures and customer needs and trends in order to identify the next platform. This team typically reports to senior management.

The overall product development process in an SBU needs to be lead by 5 constituencies: 1. Senior Management; 2, R&D Management; 3. Process Owner; 4. Portfolio Manger; and 5. Product Line Planning Team.

CORPORATE VENTURING – top right corner

These are organizations which fund and establish businesses based on technology advances which have broad applications outside the market strengths of the parent company. This is an area that goes through hot and cold phases almost on a 10 year cycle. The reader is encouraged to review articles by Chesbrough (2000) and Miles and Coven (2002) for a more extensive discussion.

The standard for external corporate venturing is embodied in Lucent's new ventures group (Chesbrough, 2001). The unit created a portfolio of 26 companies valued in excess of \$200 million with an impressive internal rate of return of 70% (Chesbrough, 2001). Despite their

success the unit was sold when Lucent became strapped for cash. Similar corporate venture units, established in the same manner meet similar fate. Overall, despite the financial success, the lack of a direct link between the ventures and shareholder value represents the Achilles heel of this approach. Creating new businesses outside the value chain of the parent company does not seem to be sustainable – even when a workable process and organizational structure, like that developed at Lucent, has been developed.

Perhaps the value of external corporate venturing lies in making more strategic investments. Chesbrough (2002) provides several examples from Intel, Microsoft and Merck – where they are making investments to support the strategy of the parent company rather than to create financial returns in new businesses in new markets. Intel Capital, the investment arm of Intel, makes investments in start-ups making products which require ever more powerful microprocessors – thereby stimulating sales of the newest chips. Microsoft has set aside \$1 billion to invest in companies that help advance its “.Net” architecture. Merck’s investments are in start-ups which develop technologies that reduce the time it takes to bring a new drug to market.

Corporate Venturing is moving from the creation of new businesses in new markets based on financial return to more strategic investments. For example, Intel Capital supports start-ups which need even more powerful processors.

CENTRAL RESEARCH LABORATORY AND CORPORATE BUSINESS DEVELOPMENT GROUP – lower right corner

Both the corporate research laboratory (CRL) and business development group fall in this area. The CRL’s traditional mission has been to develop and prove the feasibility of high risk exploratory research which would have significant benefit to the corporation. Traditionally these units were relatively independent of the SBU’s – being funded through a corporate tax and free to pursue high risk technologies. However, considerable reorganization in most CRL’s occurred during the latter part of the 1990’s when firms placed more emphasis on CRL’s to produce bottom line results. Most companies increased the SBU “...focused level of funding from between 30-50 % to up to 70-80%...” (Glass, et. al. 2003, pg 25). This has resulted in much stronger alignment of the CRL with the SBU.

Several organizational structures to achieve better SBU alignment are being utilized. The relationship manager and individual initiative model are discussed in a recent article by

Glass, et. al. (2003). The relationship manager reports directly to the head of the CRL. This person's responsibility is to focus on the relationship between the CRL and SBU and assure that the goals of the SBU are met so that the SBU obtains value and maintains its funding commitment to the CRL. In the more effective examples the relationship manager reports directly to the head of the CRL, but does not have a line responsibility so that their focus may be mainly on the CRL-SBU relationship. Typically the best relationship managers were long term researchers who were well respected by both the CRL and the SBU. In the individual initiative model individual networking between the CRL and SBU is strongly encouraged. It is the researchers' responsibility to work with the SBU. This method only works effectively when there already exists a strong culture of CRL-SBU interaction. In addition the performance review system combined with the financial reward system needs to reinforce these individual interactions.

Corporate Research Laboratories (CRL) typically have projects which are jointly funded by both the corporation and the SBU. To achieve success a relationship manager, reporting directly to the head of the CRL, is often utilized to foster effective collaboration between the CRL and SBU.

The second structure in this area is the business development group whose mission is to develop new businesses which are built on the core competencies and capabilities of the organization, but are corporate funded. The overall goals of these units are to create "greenfield units" which are kept somewhat distant from operating SBUs. A well documented example is Proctor and Gamble's corporate business development group (Whitney and Amiable, 1997) which put aside \$250 million of seed money to develop at least one major business per year. While they have handed off 5 projects to the business sectors they have yet to develop a profitable business since the SBUs have had difficulty allocating people to the new project. This transition from the internal corporate venture group to the existing businesses is a classic problem of separated business development units which are funded by the corporation.

Though the Achilles heel of these autonomous organizations will probably remain their difficulty in transitioning to the mainstream business

What organizational architecture is needed in order to deliver on breakthrough projects if the one discussed previously don't work? A number of companies have begun to adopt a new model for achieving breakthroughs which are jointly conceived and funded by both the SBU and the Corporation. In this way the SBU does not feel that it is sacrificing its current business to pursue this large but potentially risky project. The value of this approach is that it allows the SBU to share its core competences and capabilities and business acumen with the new project.

Early results from several companies indicate that this approach appears to be very successful and avoids the transition problem of the internal venture group. Four characteristics for success have emerged:

- Senior management commitment. Senior management commitment to dedicate the resources and provide a culture to sustain projects which are high risk and may displace the current business is a necessary condition.
- The use of full time heavy – weight project teams (Clark and Wheelwright, 1992). The “emergencies’ of today will quickly prevent the team from doing the heavy lifting without full time commitment. In addition, the team needs to be populated with participants who have credibility and political savvy in the organization so that the new high risk concept can survive the expected corporate immune response.
- Future opportunities which are based on market and technology trends. In other words looking for where the “puck” is going as opposed to where it has been. Perhaps Seagate’s leadership in the disk drive market (Bower and Christensen, 1995) would not have evaporated had they been watching the market trend to smaller drives.
- Building on the core competencies and capabilities of the company. Ultimately the breakthrough needs to be sustainable and provide value to the company. Leveraging the core competencies and capabilities of the company allows this to happen.

Business development groups, jointly conceived, by both the SBU and the corporation are emerging in order to avoid the transitioning problems of totally separated groups. Characteristics for success of these new groups include: SBU Senior Management Commitment; Heavy Weight Project Teams; Opportunity Analysis based on market and technology trends and leveraging the company’s core competencies and capabilities.

Two additional models, separate from the Corporate Research Laboratory and the traditional business development group have been emerging. The first is a separate autonomous organization for creating and managing disruptive businesses. This approach is advocated by Bower and Christensen (1995), in their classic Harvard Business Review article and in their new book (Christensen and Raynor, 2003) on disruptive technologies. Two models for disruptive business are presented. The first is a low end margin business, which eventually disrupts the high end business through up market migration. An example is steel minimills which make steel in electric arc furnaces. Because of the uncertainty of the process and the varying chemistry the quality of the steel initially produced in 1975 was low. The only market that they

could enter was the low end low quality rebar market. Integrated steel mills gladly gave up this market due to the low margins. Over time (i.e. from 1975 to 1995) minimills improved their steel making capability and moved up market to the extent that they have forced most integrated steel mill industry into bankruptcy. Existing SBU's will consistently reject the low end margin business in its initial stages due to its low profitability. The second disruptive business model is when the initial customer is a non-consumer. An example of this is the angioplasty business. (Angioplasty consists of a method for expanding the coronary arteries via a balloon catheter which is threaded into the heart through a leg artery). Angioplasty in 1985 was a new procedure being done by the cardiologist to repair low complexity single vessel coronary blockages. Open heart surgery, performed by cardiac surgeons, was required for more complex multi-vessel coronary blockages. The cardiologist would be considered a non-consumer. This was a new procedure for the cardiologist which provided her with a new source of revenue. The cardiac surgeon did not see this as a threat since the cardiologist was able to correct only very minor coronary blockages. Over time (i.e. 1985 – 2000) angioplasty has become more sophisticated, can handle complex multi-vessel disease and has now decreased the number of open heart surgeries being performed. Once again sustaining SBU's will reject this non-consumer business model since the niche is initially too small and does not support the mainstream SBU customers. Based on these findings Christensen and Raynor (2003) posit that both low end margin and non-consumer businesses be separated from existing SBU's since their initial strategies and values will always lead to rejection by the mainstream SBU.

Christensen and Raynor (2003) advocate that a separate and autonomous business development group is required for the low end margin and non-consumer disruptive businesses since they will be consistently rejected by the SBU as either not providing enough profit or serving the wrong customer. Over time these disruptive businesses have the potential for replacing the SBU business.

The second emerging business model is referred to as "Open Innovation" (Chesbrough, 2003) where the company more actively looks for ideas and new products, which provide a fit with the company's value chain, with a much larger focus on external innovation. Proctor and Gamble has created a new position called "Director of External Innovation" whose goal is to increase innovation acquired from external sources by 50% in the next 5 years from their current estimated 10% in 2002 (Chesbrough, 2003). Companies like CISCO and Nokia have a long tradition of actively looking and acquiring already proven technologies rather than invest in

internal development. Perhaps the Director of External Innovation needs to be another SBU management constituency added to the list indicated on page xxx.

CONCLUSIONS

Three separate structures for developing new products are discussed. Unfortunately none appear to be a panacea. The SBU product development structure (bottom left hand box of figure 1) supports ongoing businesses and while efficient, has difficulty creating entirely new businesses with high returns. In addition, the relentless quest to support ongoing customer requests for incremental extensions often quenches the effort needed to focus on new platform and breakthrough projects. Bower and Christensen (1995, pg. 53) indicate that mainstream business "... fail – not because they make the wrong decisions, but because they make the right decisions..." and relentlessly focus on today's customer needs rather than tomorrow's market trends.

The SBU product development structure supports ongoing businesses and while efficient, has difficulty creating entirely new businesses with high returns. Corporate Venture Groups and Business Development Groups are needed to support the development of "breakthrough" projects.

The external venture group (top right hand box of figure 1) was posited as a method to create new businesses for the corporation based on new technologies created by the firm – but which did not easily fit into existing SBU's. Unfortunately, this concept does not appear to be sustainable in public companies since the stock market does not reward companies for building entirely new businesses outside their value chain – despite the good financial returns which these units have demonstrated. Perhaps the sustaining role for these external venture groups will be more strategic than financial as indicated by the Intel, Merck and Microsoft venture examples.

The "optimum" overall organizational structure of the internal ventures group (bottom right hand box of figure 1) has yet to emerge. One approach being adopted by a number of companies are projects jointly conceived by the SBU and the corporation, but where the team members are isolated from their "day-to-day" activities. They are allowed to work on the project, almost exclusively, but within their existing SBU's. The people in this latter organizational structure are separated from the emergencies of the day, but not the competencies, capabilities and personal networks which are often needed to create the breakthroughs for the future. This

model fits with projects that aligned with the strategy of the SBU. The second approach, being advocated by Christensen and Raynor (2003) is for disruptive businesses. These do need to be separated from existing SBU's since the SBU will consistently reject them.

The Corporate Research Laboratory (bottom right hand box of figure 1) is going through a similar transition from an independent and separated research organization to one which is better aligned and jointly supported by the SBU. This new model should decrease the classic transition problem discussed previously in this chapter.

Getting to new platform and breakthrough projects will continue to be a struggle for companies. However, new structures, discussed in this chapter, are beginning to emerge which simultaneously allow separation from main stream incremental product development, but are yet not so distant that their results become irrelevant to the mainstream businesses.

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Bio

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FIGURES:

Focus of Innovation	SBU	Corporate
External	<u>Mergers and Acquisitions, Joint Alliances and Co-development</u> Ex: Division acquires or purchases an equity position,	<u>Corporate Venturing</u> Ex: Corporate Venture Fund for external ventures in specific technology or industry sectors
Internal	<u>SBU Business Development</u> Ex: Projects are developed within the SBU	<u>Central Research Laboratory</u> Ex: Research Center funded by corporation to work on high risk technologies <u>Corporate Business Development</u> Ex: Venture Fund for funding internal projects

Figure 1. Overall typology of corporate organizational structures where innovation may occur.

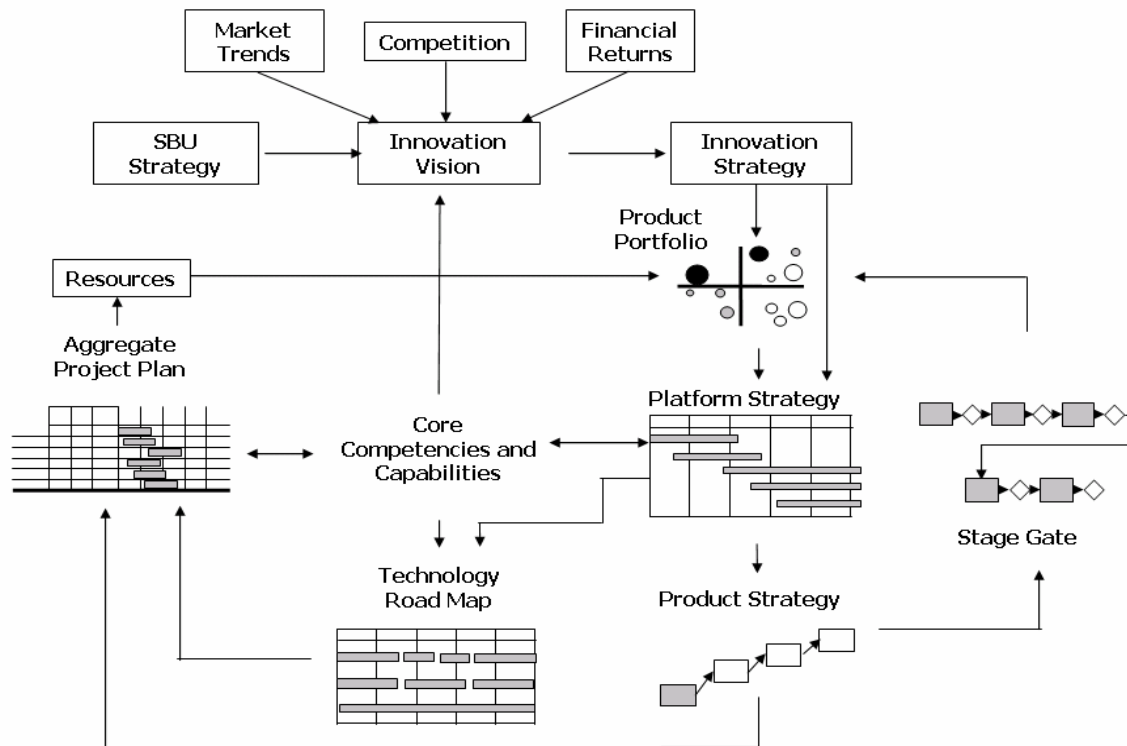


Figure 2. Overall product development architecture that exists within a Strategic Business Unit.

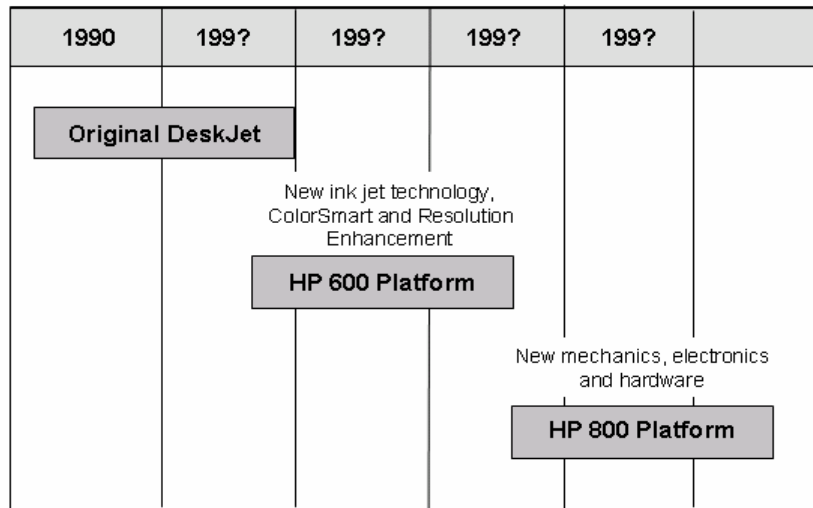


Figure 3. Platform strategy map for the inkjet printer. (The exact dates on the top of the diagram need to be determined.)

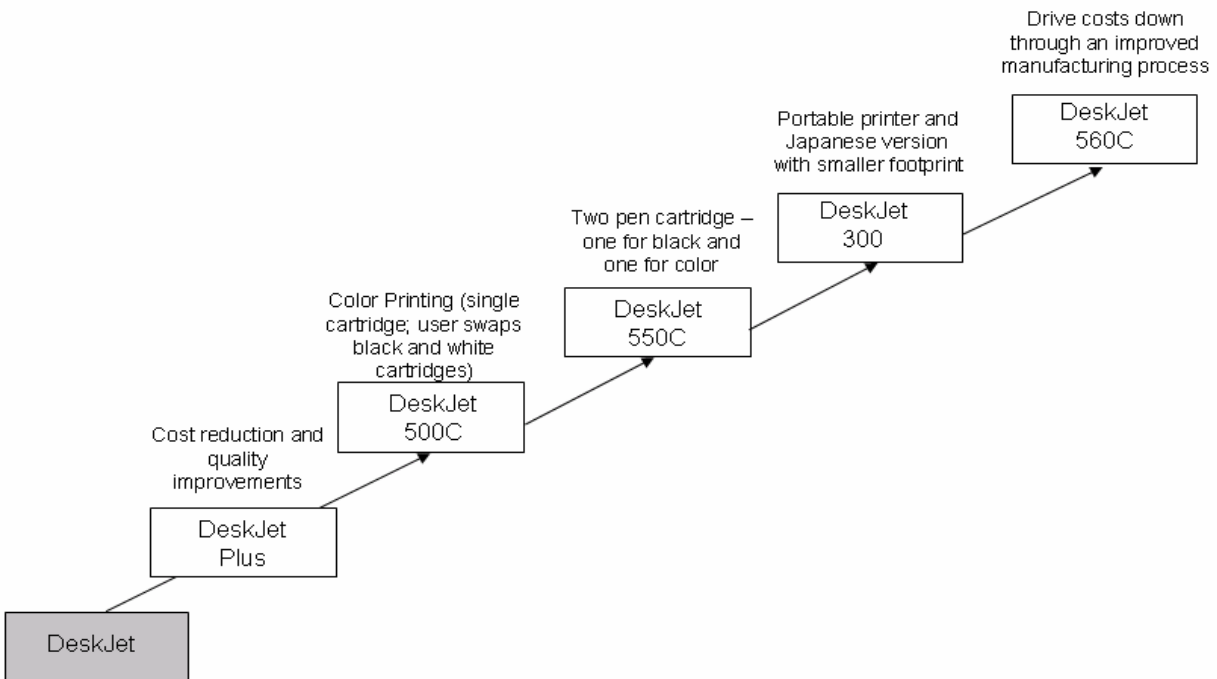


Figure 4. Product generation map for the Original DeskJet platform.

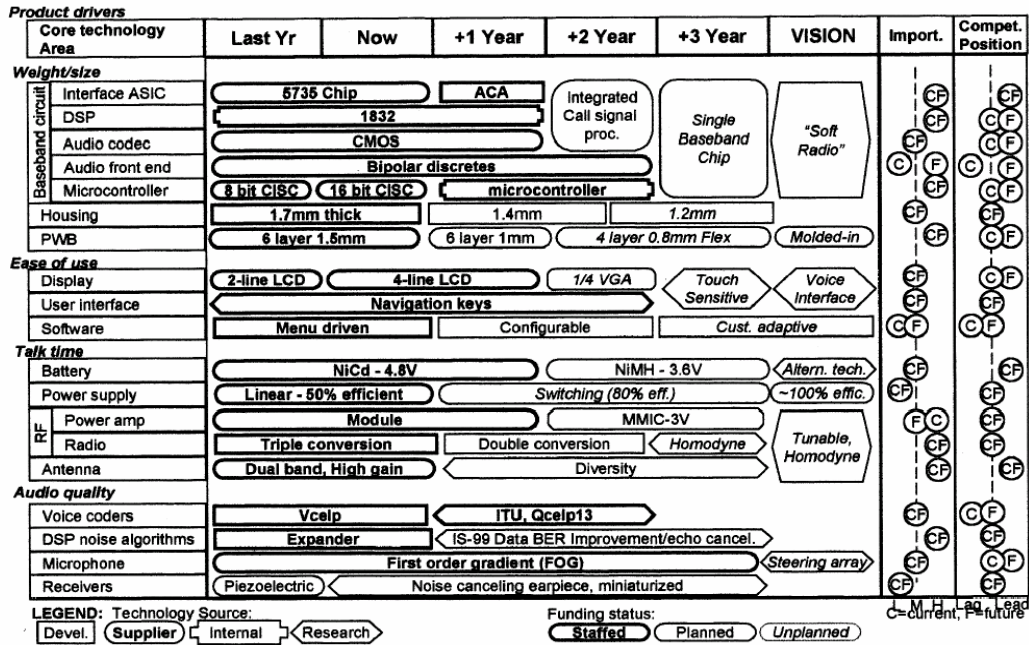


Figure 5. Technology Road map for the cellular phone indicating customer and technology requirements on the ordinate and current technologies that are envisioned for now and in the future on the abscissa. (Copyright permission will need to be obtained. Would only be used if there was no example of a Technology Road Map in any other section of the Handbook. If there was an example – this figure would be eliminated – and a reference made to the applicable section in the handbook.)