

Project portfolio management

Definitions

Project portfolio is a collection of projects carried out in the same company or organizational unit with the same strategic objectives and the same resource pool.

Project portfolio management is the art and science of applying a set of knowledge, skills, tools, and techniques to a collection of projects in order to meet or exceed the needs and expectations of an organization's [investment] strategy.

Project portfolio management is a process that includes decision-making, prioritization, review, realignment, and reprioritization. The emphasis is in management of strategic content of projects at the aggregate level (= at the level of collection of projects). In project portfolio management, the terms 'selection' and 'prioritization' is often used interchangeably (= as synonyms). These terms refer to 'decision making' concerning the portfolio. Because the focus on project portfolio management often is in decision making, many systematic methods that have been developed, are therefore often related to decision analysis. However, a broader view on project portfolio management includes organizational

arrangements (e.g. responsibilities, for example use of centralized vs. decentralized responsibilities), use of different roles (for executives, project managers, or project management office PMO), and various management approaches and principles in managing the portfolio.

Project portfolio management process

Project portfolio management process is shown in Figure 1 (modified from Archer & Ghasemzadeh). The management system in the figure includes a three-level management system: 1) business development and strategy process, 2) project portfolio management process, and 3) project process. Finding new opportunities (or new project proposals) may come from any level. The decision at the portfolio level is always a 'portfolio decision', although the objects of the decision are single projects (in the portfolio).

The three objectives of project portfolio management are:

1. Maximizing the value of the portfolio.
 - Maximizing the value of the portfolio against a more specific goal of the company, such as profitability. However, the company may have multiple goals that relate to the broad concept of value; this implies that the objective of value maximization becomes a multi-variable maximization/optimization problem. Furthermore, the value may be different when having a different time span, which means that balancing between short-term vs. long-term perspective is important.
2. Balance in the portfolio.
 - Balancing can be made in many dimensions, e.g. risk versus reward, ease versus attractiveness, or breakdown by project type, market or product line.
3. Link to strategy.
 - The key issues are strategic fit to company strategy and resource allocation which reflects the business' strategy. The aim is to link the whole portfolio to strategy and not just single projects as separate parts. Therefore, it may occur that a single project has a perfect fit with the strategy, but that particular project is killed or put on hold. This may occur if there are other projects that already will contribute to the same specific strategic purpose (and thus it is not appropriate to invest any more for this purpose), or if there are projects with higher priority when considering the portfolio as a whole (and not the good and outstanding qualities of a single project). Furthermore, as regards to the link to strategy,

also projects may be selected to the portfolio which fall outside the current strategy but are there for renewing/changing the strategy.

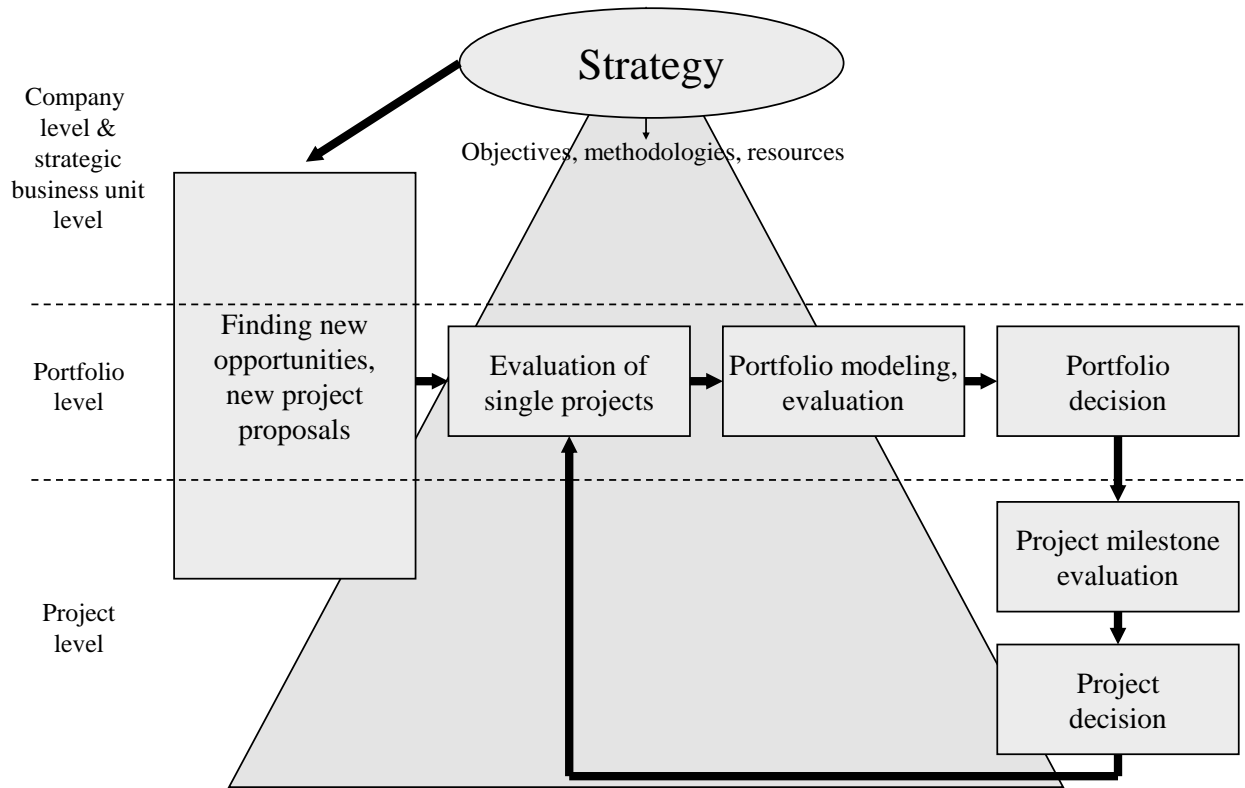


Figure 1. Project portfolio management process

Project as a stage-gate process

Project can be managed as a process that comprises phases/stages and “gates” (stage-gate process, Figure 2). Gate is a decision-making point where the results of the preceding phase is analyzed, and a decision is made. The decision can be one of the following: go-to-next-phase, kill-the-project, return-to-previous-phase, or put-the-project-on-hold.

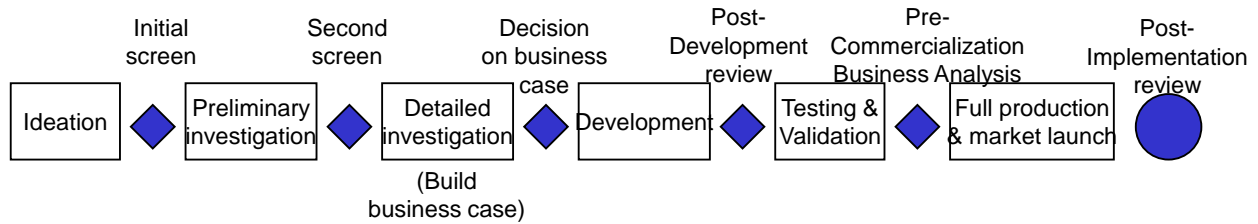


Figure 2. Project as a stage-gate process (modified from Cooper)

Options thinking in decision making: projects as options

Managing a portfolio of projects can be seen as managing strategic options. Luehrman presents an analogy to managing a portfolio, which is growing a garden of tomatoes. If the tomatoes are ripe and perfect or totally rotten, it easy to make the decision, but if they are something in between, with varying prospects, the decision is a lot more difficult.

Active gardeners are not only making decisions; they are monitoring the options and looking ways to influence the variables that determine the value of the option and, ultimately, the outcomes. Option pricing can help estimate the value of the entire year's crop before the season actually ends.

If a project is in a state that it neither seems very interesting nor uninteresting, it might be wise to wait, but not for too long, to make the decision. Figure 3 (from Luehrman) presents a model of how to locate a project and how to determine whether to invest into it now, maybe, or never. In regards to the figure, there are two important variables to consider: first, the value-to-cost ratio is the estimated return of the project divided by the expenditure required to build or buy it, and, second, volatility describes how much the situation can change before the decision must be made.

When time passes, projects can move in the model illustrated by Figure 3. In general, projects tend to move to left and up since the time for the decision deadline and the benefits of the project diminish. With the help of good luck and active management, however, they can move to the opposite direction as well. A project's position in the model can be also influenced by threats such as: new entrants, suppliers, customers, substitutes or competitors. (this option thinking section has been adopted and modified from Aalto).

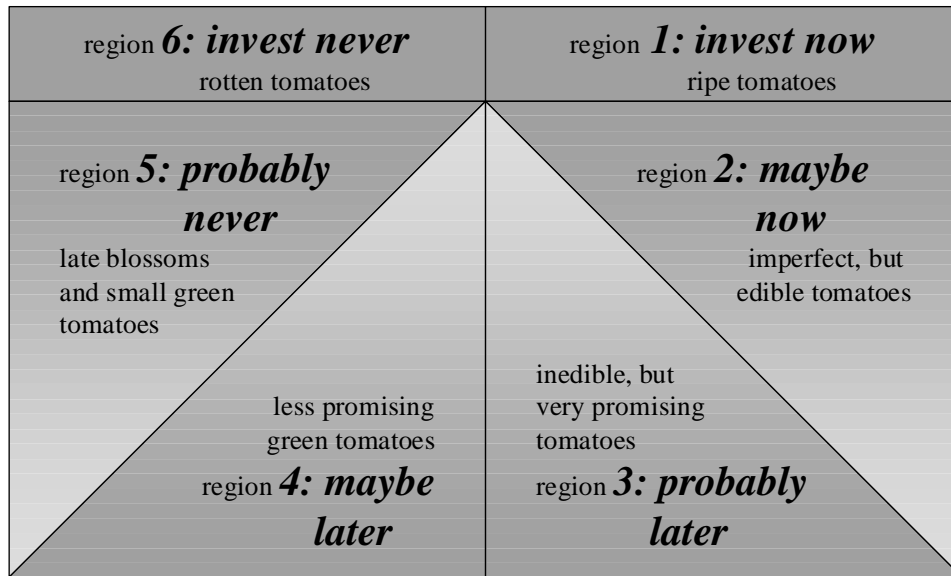


Figure 3. Tomato garden model for mapping options

Management over different time spans

Figure 4 illustrates three decision-making levels with three different timing principles. At the lowest level, projects are started, and decisions are made (by managers) on the projects' life cycles on specific decision-making points (gates). Projects cannot wait for decisions (e.g. portfolio board decisions), but the decisions are made whenever needed to make the project to proceed. At the mid-level, portfolio board meetings are held regularly, for example on a monthly basis. The portfolio board is an existing body, for example the board consisting of middle managers which belong to the pre-existing board of the organization unit respectively. The data for portfolio board meetings is accumulated from projects at the lower level (the dotted-line arrows in the figure indicate the accumulation of the data from projects' gates to upper-level portfolio board meetings for decision-making). There must be a individual or an organizational unit (e.g. project management office, PMO) which is responsible for instructing which data must be recorded for each project in a database for portfolio analysis and decision making purposes, and this individual/unit also prepares portfolio analyses and decisions for portfolio board meetings and portfolio reviews. At the top-level, portfolio reviews with top executives are held more seldom, e.g. four time a year or so. These top-executive review meetings may be held in conjunction with the firm's strategy process, see the strategy clock example in Figure 5.

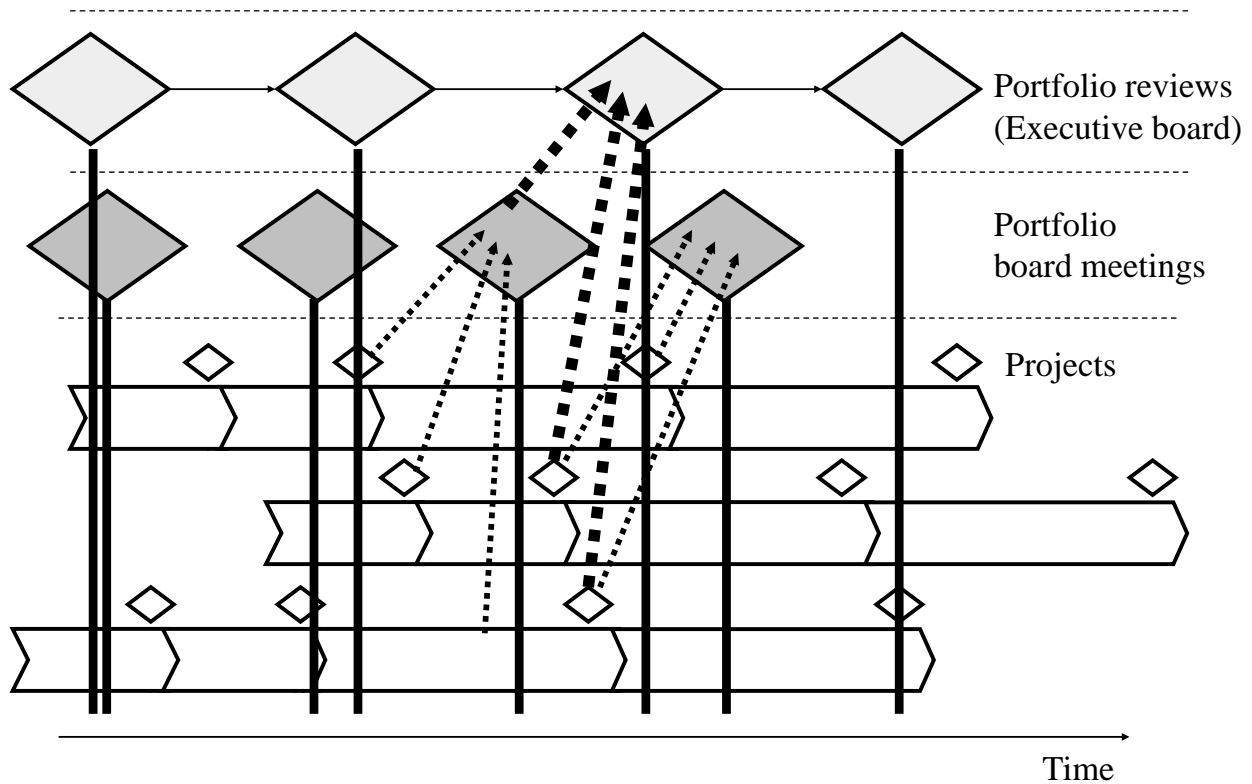


Figure 4. Three decision-making levels with three different timing principles

A strategy clock is shown in Figure 5. The strategy clock illustrates the firm's yearly strategy process cycle, from January to December. In October, in conjunction with the budgeting, the creation of the next year's strategy starts, simultaneously with assessing the strategy process and following-up the strategy implementation of this year that is coming to an end. When creating the next year's strategy, next investments are thought about simultaneously, and on-going projects started or progressed during the year, may help in this strategy creation as these projects feed in ideas, results, and lessons learnt to this strategy creation activity. In January then, i.e. in the start of the new year, the portfolio of projects is reviewed to ensure that the projects and the whole portfolio implements the strategy treated for this particular year.

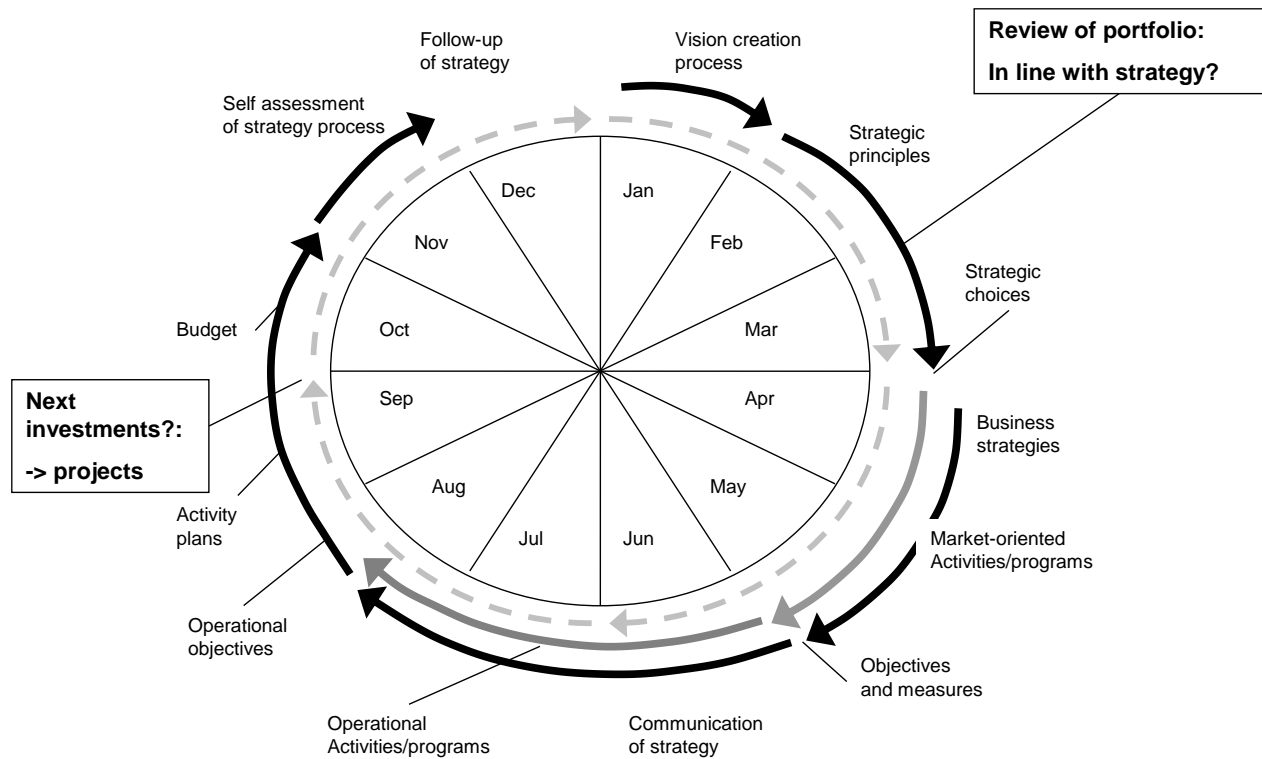


Figure 5. Strategy clock: linking of business strategies with project portfolio

Figure 6 illustrates projects that are scheduled with using a bar chart format. This kind of chart allows for evaluation of the resources needed in specific time spans in the future, if these projects would be executed. Also, other aspects of timing of projects can be planned, in case of dependencies between projects, or potential coordination and information exchange needs between parallel or sequential projects. However, an important aspect to consider is also the completion times of the projects in the portfolio: when are the potentially valuable results of each project available? Is the timing of projects' results acquired in the future appropriate for matching the market demand and for outperforming competitors in launching new projects in the market, and is the timing of organizational development projects appropriate for fast enough introduction of the company's business practices, for the company to be competitive enough?

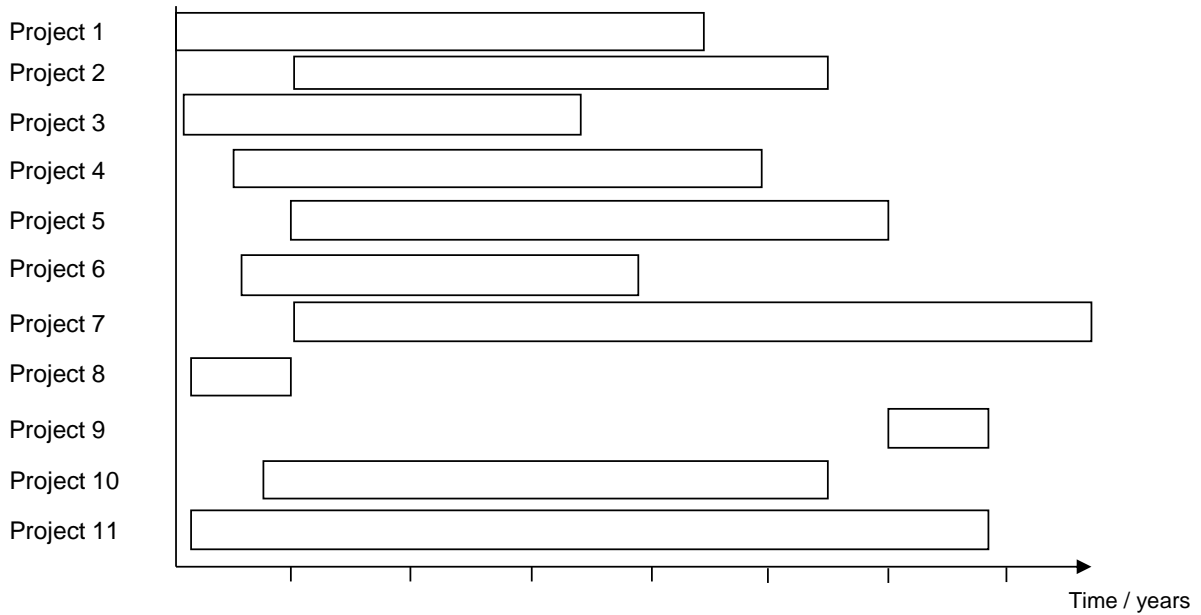


Figure 6. Project chart

Portfolio decision making funnel

Figure 7 illustrates a funnel where projects are selected/prioritized while others are killed. One major challenge is to foster the creation of project ideas: the more project ideas to select from, the better are the chances of creating a portfolio with more significant value-enhancing qualities. Another major challenge is to kill projects (or project ideas) effectively, in order to enable investing on those carefully selected projects that make up the best portfolio.

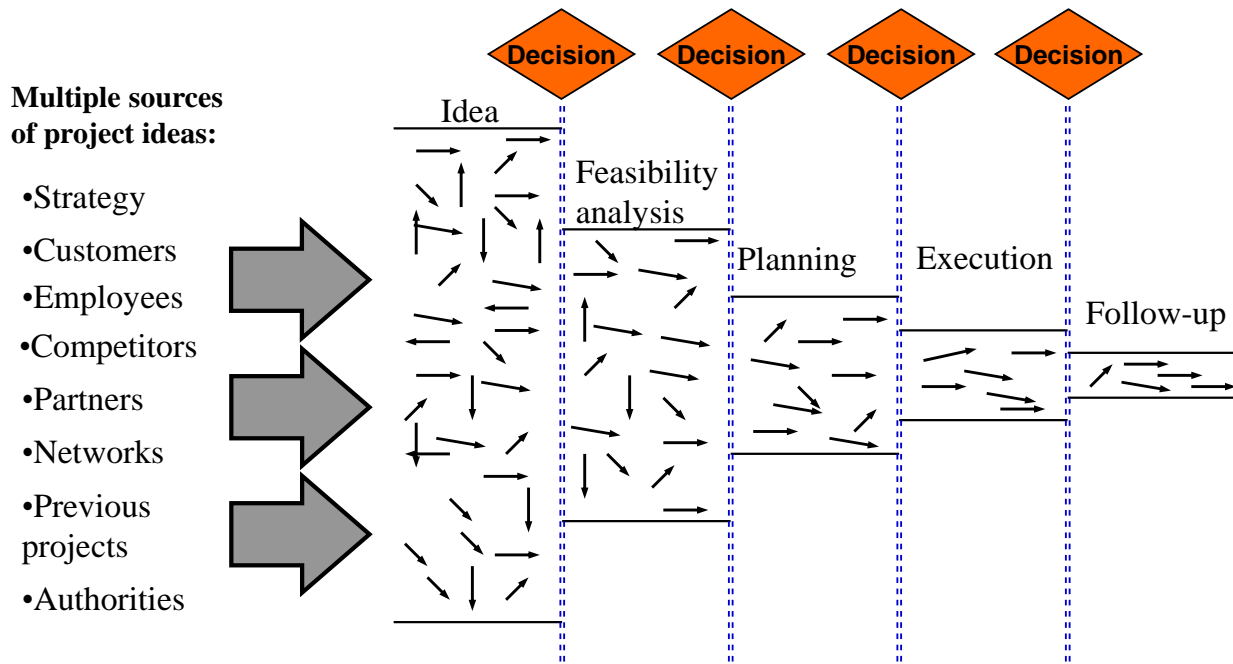


Figure 7. Portfolio decision making funnel

Well-structured processes vs. decentralized responsibilities

In his article, Loch analyzed the project portfolio and its management in a European technology manufacturer firm. He distinguished between three product development project clusters: incremental projects, line extensions, and radical projects. These clusters were defined in the following way:

- Incremental projects involved low level of product and market newness.
- Line extensions targeted to new market segments or new geographical regions, but the product newness was rather low.
- Radical projects were projects with new technologies and new target markets, with a weak market position but offering high growth.

Indeed, market newness and product newness (or technology newness) are important determinants in evaluating projects, and in making portfolio decisions. However, Wheelwright and Clark provide a project classification analogous to Loch's clusters – described in Figure 8 – which is based on newness related to product and process [i.e., process for running the business, e.g. in producing and distributing the product].

Figure 8 distinguishes between internal projects based on research and development, which are a precursor to commercial development for external markets, in breakthrough, platform, and derivative projects.

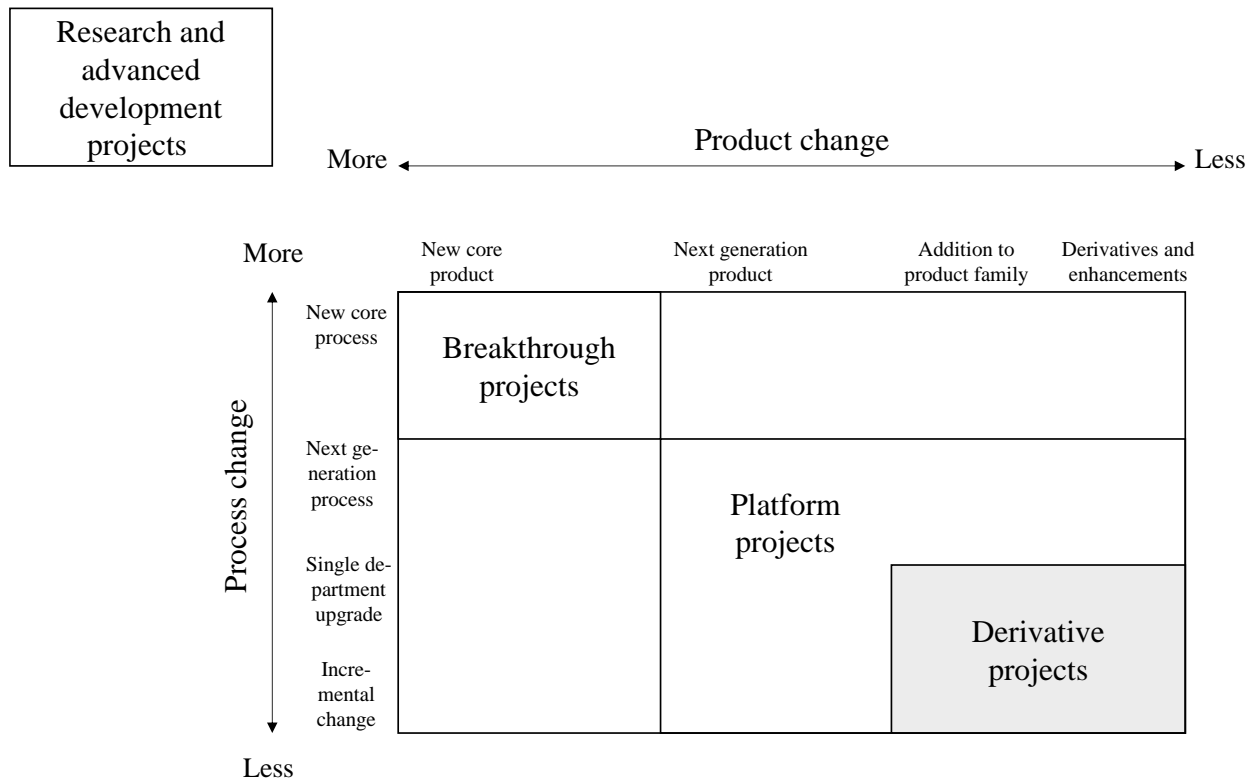


Figure 8. Classification of development projects (according to Wheelwright and Clark)

Loch also categorized the projects into three different project types, according to three different processes of how projects were selected to the portfolio: formal process projects, pet projects, and under-the-table projects. These project types were determined by the selection process in the following way:

- Formal process projects:
 - the formal process projects were selected to the portfolio by using rather structural stage-gate decision process where projects were evaluated at each gate by using pre-determined and well-structured evaluation methods and criteria.
 - one could think that projects in the radical projects cluster with substantial newness, would not survive in the formal process and hence radical projects have a greater likelihood of being killed in a formal process.
- Pet projects:
 - pet projects had a powerful sponsor (executive) at a high level in the organization hierarchy. Therefore, as a pet project's selection and prioritization is based on the

sponsor's/executive's commitment and support, pet projects were executed anyways and hence pet projects have not been put to the formal process

- a pet project signifies the fact that the sponsor/executive carries his/her responsibility by pushing forward a pet project, which may turn out to be extremely successful, but it also may turn out to be a complete failure.
- Under-the-table projects:
 - under-the-table projects were projects that were not exposed to top-level executives, but they were hidden by lower-level managers or the personnel by keeping them 'under-the-table' where they were not visible in the company management systems.
 - one obvious reason why under-the-table projects could not have been put in the formal process is that they would not have been survived in in the process, for example because of being rather radical (new) and therefore falling outside the company's current strategy. Also, the viability of a very early idea is difficult to evaluate to convince the decision maker, and therefore it is appropriate to put small budget sums aside and develop an under-the-table project until the project has reached a state where its benefits can be argued to higher level executives.
 - under-the-table projects represent decentralized responsibilities in the organizing: the responsibilities are given to lower level managers/individuals who have enough freedom and the authority to seek the best possible situations in the situation and circumstances at hand. In fact, in the case of under-the table projects, the responsibility is not necessarily 'given' to lower level individuals, but it is 'taken' by individuals at the lower levels. However, a company could also organize its project portfolio to include 'small probes' projects which are more like 'learning experiments' (e.g. learning from the behavior in the market) or 'testing new technologies' with uncertain outcomes; in this respect, the projects need not necessarily be hidden under the table, but the company's management system could encourage investing openly in projects having a potential to contribute to lessons learned (e.g. learning from a failure, or learning from creating a scenario of the future – even an non-viable or non-desired scenario or product concept). Furthermore, sometimes projects may be justified even though their outcomes would never be used in practice: for example, it may be justified to develop a certain technology in a project, just in case (i.e., in case of this technology would become dominant in the uncertain market and enable a profitable business for the company that already has the technology). This above logic relates to option thinking: the more uncertain the future is (e.g. in case we

would not know which one of three distinctive technologies will become dominant in the market), the more options are worth.

Finally, Loch argued that there were not any differences in the success rates between the three project types (formal process projects, pet projects, and under-the-table projects), but the proportional number of successful projects were equal with all project types (the success was measured by the project product's commercial success in the market). In this respect, the conclusion is that it is important to match the selection, prioritization and respective implementation process to the circumstances and situational and contextual factors of the project at hand, rather than to try to put a 'one-size-fits-all' process in place.

In general, based on the above, we can conclude that the management of development projects and their portfolios is challenged by the need to carefully balance between the control (that can be achieved through well-structured processes) and the freedom to allow for innovations (the freedom can be achieved, for example, through decentralized responsibilities in the organizing).

Another example on balancing between control (or well-structured processes) and freedom (or decentralized responsibilities by autonomy and self-direction of individuals in the project teams), is the following study by Brown and Eisenhardt. Brown and Eisenhardt have studied management of multiple-product innovation projects in six firms in the computer industry, and some of their findings are briefly presented in the next two paragraphs as an example of successful project portfolio management. Based on the study by Brown and Eisenhardt, successful portfolio management includes the following two characteristics described in the next two paragraphs.

First, successful multiple-product innovation uses organizational arrangements that rely on responsibilities and priorities with extensive communication and design freedom to create improvisation within current projects. In the management of companies with successful projects, rather than just communicate, managers combined only limited structure or "semistruktures" (e.g. priorities, clear responsibilities, formal meetings) with extensive freedom to improvise current products. The semistruktures balance between order and disorder. Priorities ensured focusing on core business and they were tightly tied to resource allocations. Managerial roles were defined to emphasize the ownership of project schedules, profitability, and product definitions. Successful companies had clear priorities and responsibilities, but most of the design process was not well specified. Some firms with poorer success employed an overly structured development process. There were processes in place in which projects were planned out with work broken down into small tasks and then passed through a structured sequence of steps. The project passed from one step to the next in the process, with the process being governed by specifications, procedures, and

checkpoints. The developers completed their own tasks in the process and then passed the project to next developers. The objective was efficiency. Highly structured project management processes were considered as significant competence. Compared to all this structure, in contrast, the more successful firms had clearer priorities and responsibilities embedded in their system even if the work itself was more ad hoc and iterative. While communication was associated with successful project portfolios, purely organic structures such as fluid job descriptions, loose organization charts and few rules were not. Much of the communication occurred in formal meetings. One firm used weekly, cross-project engineering meetings and a Thursday product-planning meeting that was a cross-project review. The emphasis is on cross-project communication: even if it is not your own project everybody comes to the meeting to discover what others are doing. Extensive communication with colleagues and the external environment is likely to provide feedback on performance, while clear responsibilities and priorities provide autonomy and accountability for significant aspects of the task.

Second, successful firms rely on a wide variety of low-cost probes into the future, including experimental products and strategic alliances. The managers with successful project portfolios had a good sense of the future and a vision for their organizations within that future. These managers neither extensively invested in any particular version of the future, nor were they reactive. They balanced the rigidity of planning with the chaos of reacting by frequently probing into the future using a variety of low-cost probes. These inexpensive experiments, trials give managers options for the future. The companies with projects relying on a single plan were not effective, nor companies that were reactive in their management. Probes enhance learning about possible futures. While the future is uncertain, some things can be learned about it, which makes it easier for managers to anticipate and even create the future. Small losses through experimental products that fail, or futurists' predictions that do not come true are probably the most effective learning devices. This occurs as they capture attention but do not raise defense mechanisms that inhibit learning. A variety of probes creates hands-on experiences (experimental products and strategic alliances) and indirect experiences (meetings). Managers of successful project portfolios linked current and future projects. The switch between projects was based on time intervals that allowed the appropriate switch and choreographed transition procedures. Such "links in time" direct attention simultaneously to different time frames and the ties between them.

Organizing for project portfolio management: the big picture on the organizational context

Portfolios of different project types are typically positioned under the governance of organizational units or responsibility areas. Figure 9 describes two business units within one company as two hierarchical

organizations which stand side by side. Projects are positioned at the lowest level of the hierarchy. Management processes above projects must link projects to business goals and assist in reaching or exceeding the expectations set by company strategy. Figure 9 illustrates cross-organizational processes between the two business units at strategy, portfolio, and project levels. The challenges in organizing for project portfolio management relate to the question of communicating in the hierarchy and in between hierarchies. Relevant questions are the following. Are portfolios looked at only one level, or should there be another level of 'combined' portfolios? Should executives at the top of the organization be knowledgeable about single projects and make decisions concerning single projects, or should their attention be maintained at the level of the whole portfolio only? How does the portfolio board of one business unit get information about a similar project in the other business unit with same developmental goals (for deciding to do the project jointly, to avoid double resource usage in two separate projects for same results)? How the other business unit gets information about projects in the other business unit, in order to take advantage about the results? If the top executive board decides to establish a company-wide development program with significant resource requirements from all business units, then how does this higher-level prioritized program affect the portfolio at the level of a single business unit where the resources may not anymore be sufficient for all projects that were previously under implementation? Should there be project management offices (PMOs) – or responsible individuals – only at the level of business units, being responsible for collecting the project data and preparing for portfolio board meetings, or is there also a need for an additional company-level PMO being responsible for a company-level perspective on the portfolio(s)?

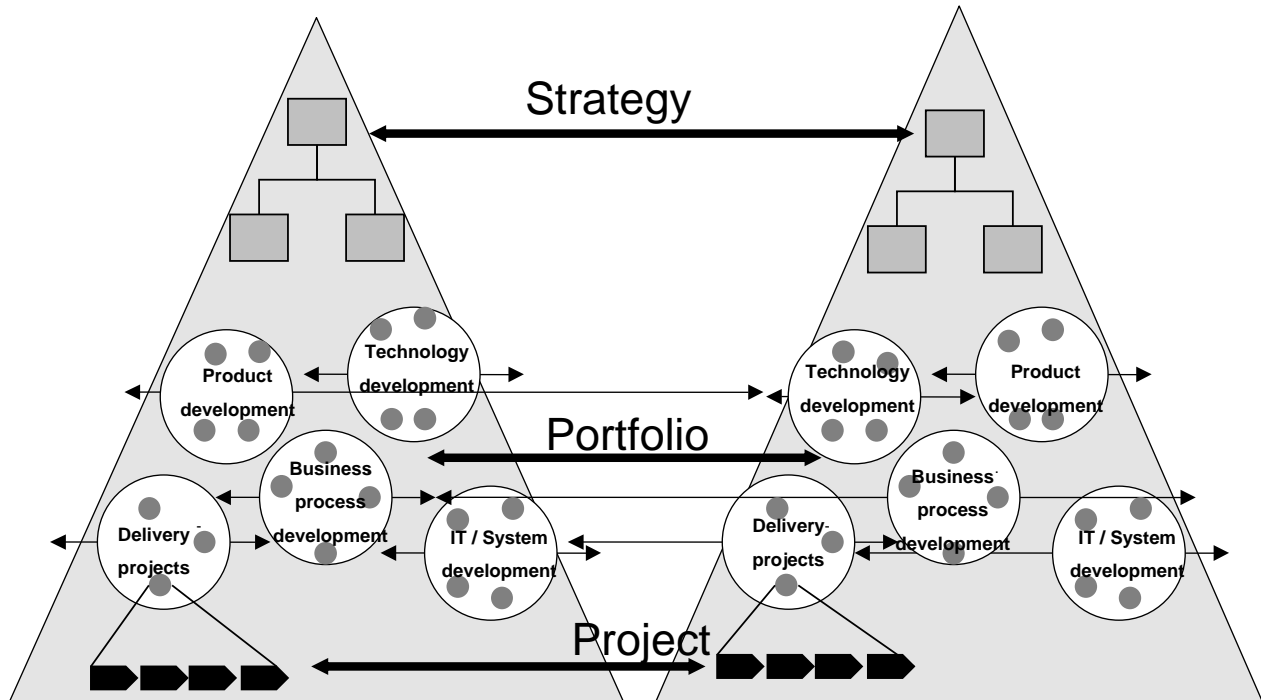


Figure 9. Two business units within a company, with cross-organizational processes at strategy, portfolio, and project levels

Idea management

Earlier many large companies have used suggestion boxes for gathering ideas from their employees. Potential problems with suggestion boxes however have been the following:

- Because the ideas were not usually focused on specific business goals, suggestion box systems tended to attract a small volume of low-quality ideas.
- Once an employee submitted an idea, he or she usually never learned what became of it. As a result, employees often became cynical, and would no longer contribute their ideas to the company.
- Paper-based suggestion box systems made it hard to ensure that all ideas were evaluated on a timely basis and in a consistent manner.

Today, idea management in companies includes often the following characteristics:

- Ideas are often created and developed in well-organized idea campaigns, where the initiation often is based on a pre-set goal derived from the company's fresh strategy, or on solving a pre-set business challenge.
- Idea management software tools are used; the software tools are designed to help organizations focus their employees on specific business issues.
- Companies have assigned facilitators and/or coordinators, which may be employees who have a part-time role in initiating, facilitating or coaching idea management workshops or campaigns in their departments. Furthermore, there is need for coordinators who facilitate the processing of ideas and their development in idea management software systems. In regard to organizing for idea generation and development, companies have 'development boards' (or 'innovation boards', often consisting of middle managers), and these boards decide on selecting the ideas that are put forward by investing on their implementation, and these boards also decide on rewarding employees on good/best ideas.
- As idea management software systems are powered by databases, the functionalities support setting up and managing a closed-loop evaluation process which automatically reminds evaluators of upcoming deadlines and unevaluated ideas.
- Web-based technologies in idea management systems help organizations to capture, share and leverage their collective knowledge and expertise.
- Idea management software systems also help tracking of key metrics (the percentage of ideas submitted vs. those that have been implemented, the estimated cost savings or new revenues generated by implemented ideas).
- One managerial challenge in companies tends to be the question of how the big number of generated 'extra' ideas should be managed: a single idea campaign may produce hundreds of good 'spin-off' ideas which only have been generated as "side-products" of the campaign. The question is how these good ideas should be taken forward towards implementation, or should the company ignore them and leave them in the system databases (on hold, perhaps), because of not having enough capacity for resourcing and coordinating their implementation.
- Another managerial challenge is related to the question of what are the criteria of a good idea: when interviewed, company representatives claim often that very 'wild' ideas with newness will be greatly appreciated, but, however, the managers' behavior contrasts these claims as the ideas selected for implementation only tend to enforce the existing strategy and support improvements (and often even small and incremental improvements) in existing products and markets. In this respect, Christensen's "innovator's dilemma" is relevant: the dilemma comes from a company's/innovator's need to carefully balance between developing already existing products

and processes and developing completely new products and processes for renewing the business. These new products and processes might be in conflict with existing products and existing strategy, and, as a consequence, the decision makers in the existing organization often ignore such ideas/projects as not relevant for the business, and the decision makers often only select those ideas/projects which support the existing business and the ultimate task of the existing organization.

Opportunity and idea generation in the front end of innovation

The ‘front end of innovation’ refers to those early phases in the product development project, which result to a concept (or product concept). This is illustrated in Figure 10. The concept comes together with a business case, including description of the product and its characteristics, market, preliminary plans for distribution, profitability calculations on the expected commercial scenarios. After creating the concept and the business case respectively in the front end, the decision to proceed to the ‘development stage’ (see Figure 10) is important as the development (of the product itself and its production) requires a significant investment.

The process in the front end of innovation is characterized by Koen et al. as a non-linear and iterative process, powered by an “engine” of organizing the process as a non-linear and fuzzy activity, which is not necessarily well-structured at the level of details. This non-linear process is described at the lower part of Figure 10, including the following phases: opportunity identification; opportunity analysis; idea genesis; idea selection, and; concept and technology development. The NPD and TSG abbreviations in Figure 10 refer to the next steps from the concept definition, i.e. ‘new product development’ and/or ‘technology screening gate’. Koen et al.’s use of the term ‘idea’ in the context of front end of innovation, contrasts our conception of broader and early idea that we have referred to above: the terminology uses in the front end of innovation involves the term ‘opportunity’ to refer to a precursor of an idea (we even can consider that our earlier broader use of the term idea, includes the concept of opportunity as it is used here), while Koen et al. considers that the term idea refers to a more matured entity which already has characteristics of a product concept. The obvious aim of using these terms in the front end of innovation context, is to give structure to the non-linear front end phase, and to show how the front end phase adds value by producing a feasible product concept through systematically processing it from starting from the opportunities, refining opportunities further to ideas, and so on. In the following, the steps in the Koen et al.’s non-linear front-end process in the lower part of Figure 10 are explained in the following:

- Opportunity identification
 - The sources and methods that the company uses to identify opportunities it wishes to pursue are the essence of this element.
- Opportunity analysis
 - Extensive effort may be committed for focus groups, market studies and/or scientific experiments.
 - The amount of effort expended is dependent upon the attractiveness of the opportunity, the size of the future development effort, the fit with the business strategy and culture, and the risk tolerance of the decision makers.
 - Both competitive intelligence and trend analyses are used extensively in this element.
- Idea genesis
 - Genesis is the birth, development and maturation of the opportunity into a concrete idea.
 - Direct contact with customers/users and linkages with other cross-functional teams, as well as collaboration with other companies and institutions, often enhance this activity.
 - Idea genesis may be a formal process including brainstorming sessions and idea banks so as to provoke the organization into generation new of modified ideas for the identified opportunity.
 - The output of this element is typically a more completely developed description of the "sensed" idea or product concept
- Idea selection
- Concept and technology development

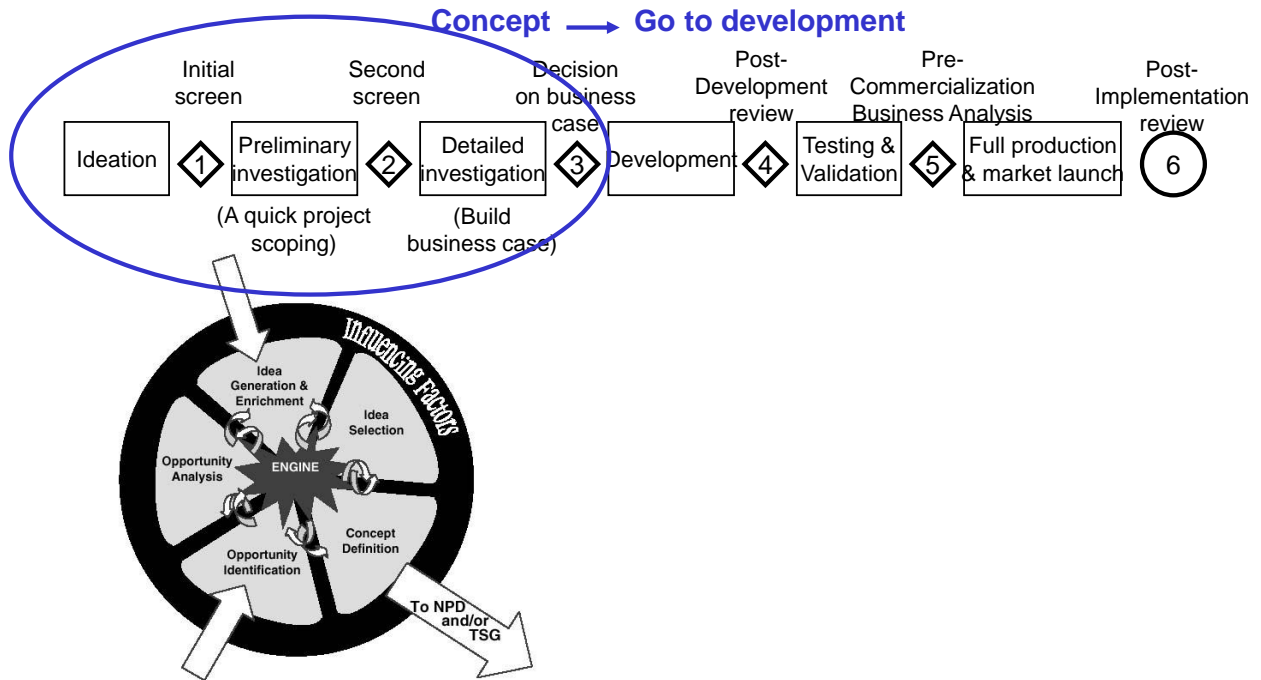


Figure 10. Front end of innovation, and Koen et al.'s non-linear process for creating opportunities and ideas

References

- Aalto T., 2001. Strategies and methods for project portfolio management. Pages 23-60, in: Artto K. A., Martinsuo M., Aalto T. (eds.), Project portfolio management: strategic management through projects. Project Management Association Finland, Helsinki
- Artto K. A., Martinsuo M., Aalto T. (eds.), 2001. Project portfolio management: strategic management through projects. Project Management Association Finland, Helsinki
- Archer N., Ghasemzadeh F., 1999. An integrated framework for project portfolio selection. *International Journal of Project Management*, 17(4): 207-216.
- Brown S. L., Eisenhardt K. M., 1997. The art of continuous change: linking complexity theory and time-paced evolution in relentlessly shifting organizations. *Administrative Science Quarterly*, 42(1): 1-34.
- Christensen C. M., 1997. The innovator's dilemma: when new technologies cause great firms to fail. Harvard Business School Publications, Boston, MA
- Cooper R. G., 1993. Winning at new products: accelerating the process from idea to launch (2nd ed.). Perseus Books, Reading, MA
- Koen P., Ajamian G., Burkart R., Clamen A., 2001. Providing clarity and a common language to the "fuzzy front end". *Research and Technology Management* 44 (2), 46-55.
- Loch C., 2000. Tailoring product development to strategy: case of a European technology manufacturer. *European Management Journal*, 18 (3): 246-258
- Luehrman T., 1998. Strategy as a portfolio of real options. *Harvard Business Review*, 76(5): 89-99.
- Martinsuo M., Aalto T., Artto K., 2003. Project portfolio management: selection of product development projects and their strategic management, Association for Finnish Technology Industries, Metalliteollisuuden Kustannus, in Finnish
- Wheelwright S. C., Clark K. B., 1992. Creating project plans to focus product development. *Harvard Business Review*, March-April: 70-82.

