Part 6 | Stage-gate process and the integration of IP

Chapter 1 | Structure of stage-gate process systems

The emergence of stage-phase systems

As development projects became more and more complex, the new product development (NPD) process needed to be formalized and structured in a way that it was still manageable. The pioneers in structuring development processes were the engineers from NASA in the 1960s, who had the task to bring a man to the moon. To achieve that, they invented phase models, where the different tasks of development were split up to smaller manageable development phases.

These models were improved in the 1980s by Robert G. Cooper who developed the stage-gate process. The motivation behind the development of the stage gate process was the separation of the new product development process into smaller phases to reduce the exceeding of deadlines and budgets in projects by setting clear goals in the smaller phases. At the end of each phase a gate was located, where an interdisciplinary team analyses the previous phase and decides about the continuation of the project.

So, the stage-gate process is basically about information gathering and decision-making. In each stage the necessary information to make a decision has to be collected and at the next gate a decision about the abortion or continuation of the project must be made (see Figure 1).

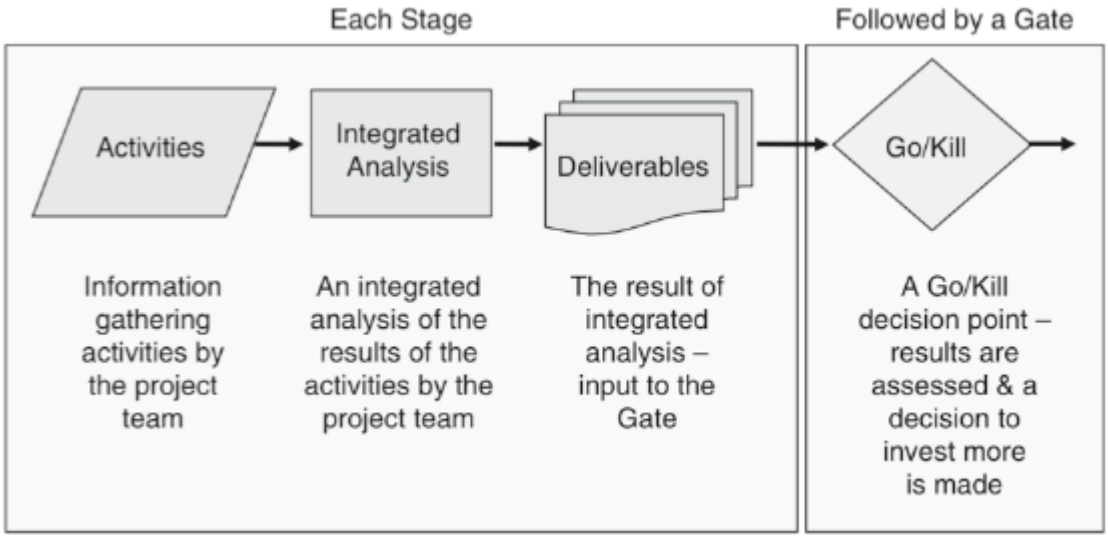


Figure 1: Activities in each stage and at each gate in the stage-gate process. Source: *Cooper R.G. Perspective: The Stage-Gate® Idea-to-Launch Process-Update, What's New, and NexGen Systems*. Journal of Product Innovation Management, 2008, 25, 213-232.*

In more detail, each phase has a well-defined action plan for the information gathering during the execution of the phase with the needed resources allocated to the phase. The project leader guides the team through the execution of the defined activities to gather the

information needed at the next gate for decision making. Typically, the stage-gate process is broken down into five stages with one additional preparation stage. Between the stages the gates are located (see Figure 2). The phases of the stage-gate process are:

- The ideation phase: In this pre-phase new product ideas are discovered and ideated. Those ideas have to be approved by the management team at the next gate.
- Stage 1: Scoping: In this phase the scope of the ideas is defined. To do so, an analysis of the market environment with readily available material is conducted to specify the key concepts and estimate the feasibility and profitability of the project. Also, a SWOT analysis can be conducted to identify the strengths, weaknesses, opportunities, and threats regarding the project (see "SWOT analysis" -> IP strategy Development: Part 7 Chapter 2).
- Stage 2. Build business case: In this phase the concept and business case are concretized. An in-depth analysis of the technical feasibility and market needs is made and also the costs, risk and feasibility of the project is assessed and defined within an outlined project plan.
- Stage 3: Development: In the development phase the first prototypes are constructed and tested both in the lab environment and with real customers.
- Stage 4. Testing and validation: In this stage the prototype is continuously tested and improved with user feedback to develop a whole product including most of the final features of the product to be launched. Also, the marketing plan is developed.
- Stage 5: Launch: In this last stage the product is finally launched, and the marketing activities start.

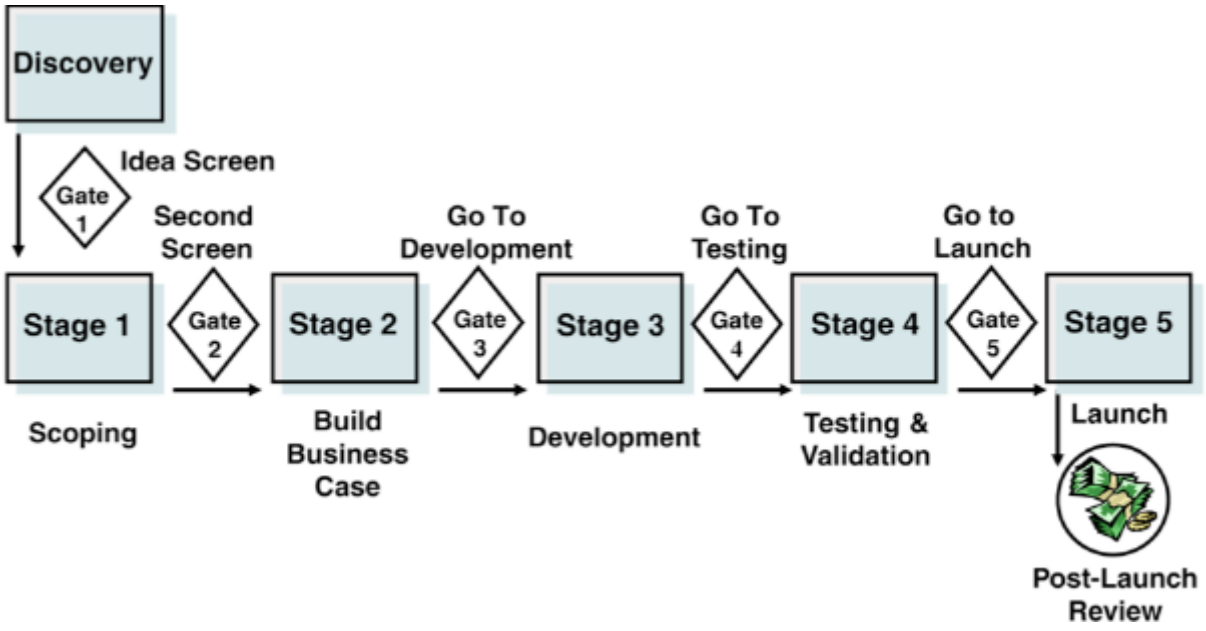


Figure 2: The 5 stages of the stage-gate process. Source: *Cooper R.G. Perspective: The Stage-Gate® Idea-to-Launch Process-Update, What's New, and NexGen Systems*. Journal of Product Innovation Management, 2008, 25, 213-232.*

Gates are the decision-making points of the stage gate process to determine the quality of the project and to decide if the project should be killed or if more should be invested into the project. Those decisions are taken based on the quality of the execution of the activities in the previous stage, the alignment with the overall business rationale, the alignment with the action plan and the reasonability to invest the needed resources to carry on with the project.

The decision-making process at each gate consists of three elements. First, the project leader and the team are providing the decision-making team with all relevant information which is needed for a decision. Those information deliverables have to be collected in the previous stage based on the decisions taken at the previous gate.

Second, the decision-makers are evaluating the quality of the project based on previously defined criteria. The typical six criteria are: strategic fit, product and competitive advantage, market attractiveness, technical feasibility, synergies/core competencies, and financial reward/risk.

Finally, the decision-making team makes a decision about the continuation of the project. The possible decision outcomes are:

- Go: More should be invested into the project and a new action plan including the needed resources is made
- Kill: The project should be aborted
- Hold: The project is set on hold and may be reviewed later again
- Recycle: Some parts of the project must be redone

Due to the killing of projects at the multiple gates the number of ideas decreases from phase to phase. This leads then to the so-called innovation funnel (see Figure 3 and "The innovation funnel" -> Integrated IP and innovation management: Part 4 Chapter 5) instead of a tunnel.

The waterfall model vs. the agile model

The stage-gate process can also be seen in the broader context of waterfall models (see Figure 4). Waterfall models are linear and sequential models, where multiple phases are following each other with clear objectives for the individual phases. The returning to a previous phase is not possible anymore once it is finished. The output of each phase is used as the input of the next phase and the results of the phase may be reviewed between the individual stages. This has some advantages, like the simple planning and controlling of the individual stages and the easy to understand deliverables at each stage, but also many disadvantages like the inflexibility to changes of the scope, no continuous testing of the product with the customers, since the product is only ready at the end of the waterfall process, and an accumulation of risks with each stage.

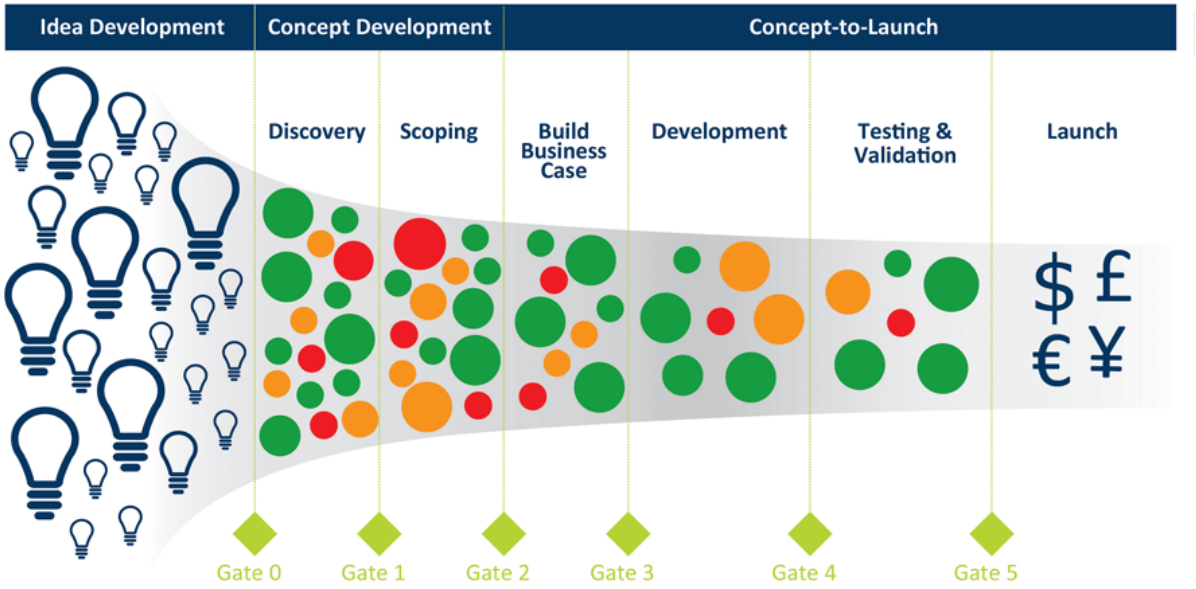


Figure 3: The innovation funnel including the gates of the stage-gate process. Source: *https://www.sopheon.com/de/ideen-und-konzeptentwicklung/#single/0*

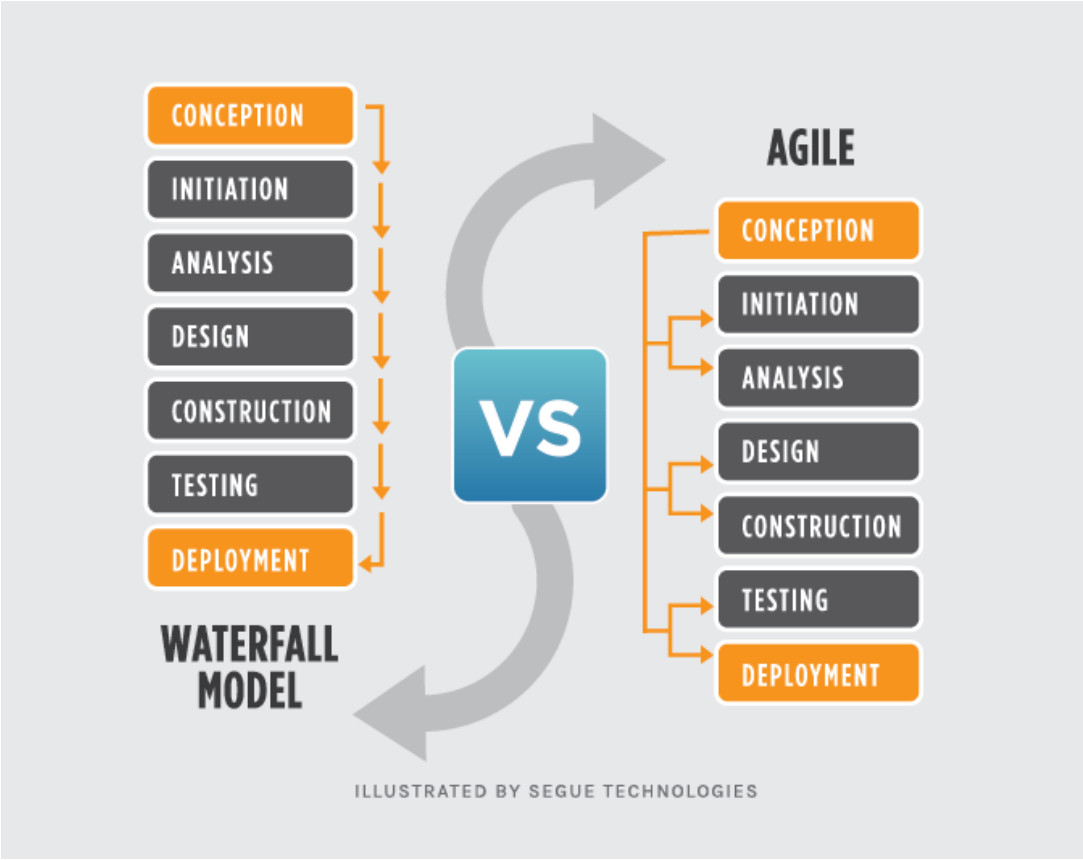


Figure 4: Waterfall model vs agile. Source: *https://www.seguetech.com/waterfall-vs-agile-methodology/*

An alternative is the agile model. The agile model fosters a team-based and iterative approach with more flexibility and a continuous improvement of the development process. Compared to the waterfall model the agile model produces already during the development process working components, which can be continuously tested and improved with the end customer. This is also possible because previous stages can always be repeated when it is necessary. This repetition of stages can also be formalized within so-called sprints. During these sprints, all stages of the agile development are run through with the aim to provide a working product at the end. The functionality of the product is then tested with the customers and a new sprint for the improvement may be planned or if the product is good enough it may be released to the market.

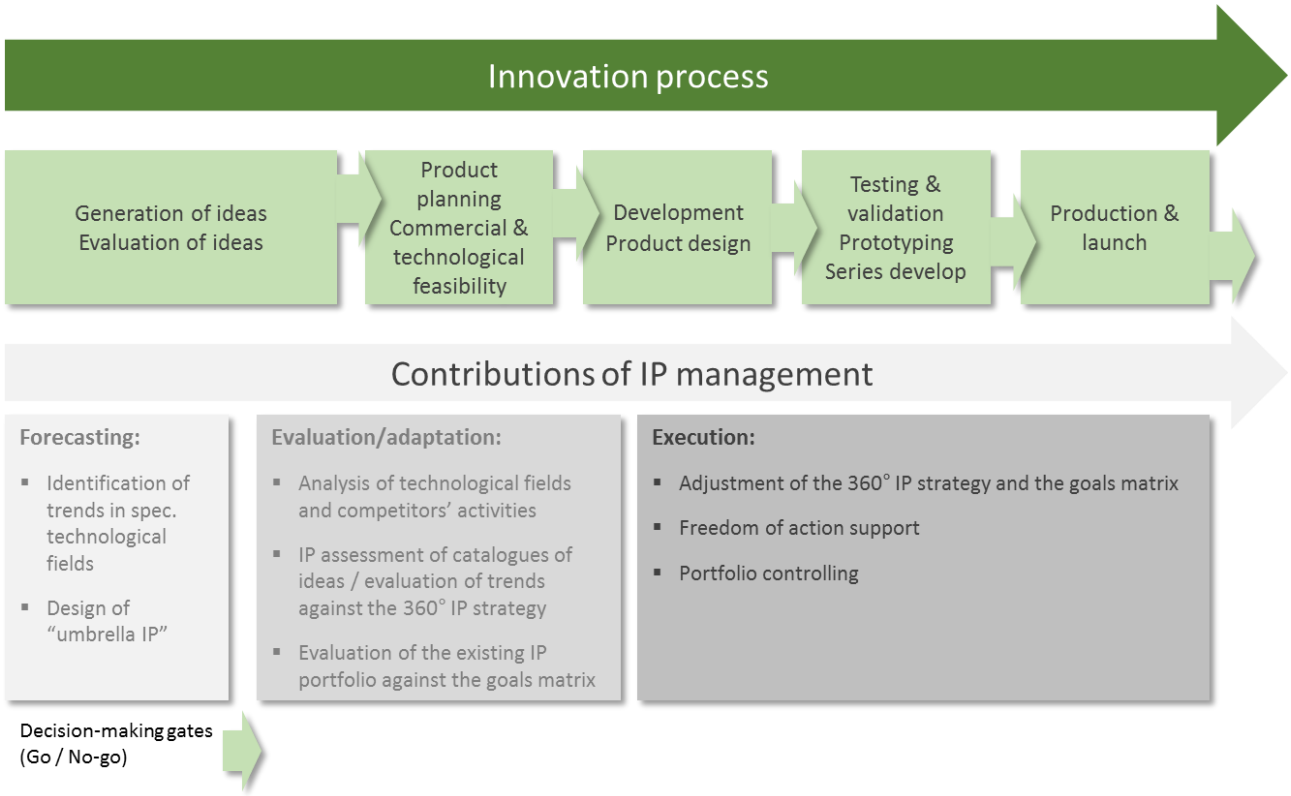


Figure 5: Integration and contribution of IP in the innovation process. Source: *MIPLM case study ifm: PMD in optical sensors*

Integration of IP in the stage-gate process – the Freedom of action process

For the improvement of innovation projects IP must be integrated into the innovation process and the stage-gate process at all stages. This can be done with the freedom of action (FOA) process which helps to secure the freedom to operate (FTO) through all stages of the innovation process and the stage-gate process from the generation of ideas to the launch (see Figure 5). The core idea of the FOA is to avoid the infringement of third-party IP rights by reacting on the changes in the innovation process during the different process stages.

In classical innovation processes concrete technical solutions become developed during the product development phase and FTO analyses are performed to analyze if third party IP

rights exist, which prevent a market launch of the developed product. If such third-party IP rights are found, the respective product components must be modified or in the worst case the whole project must be cancelled. This shows that an FTO analysis at this late process stage can lead to unnecessary development costs, which could be avoided with an inclusion of IP at an earlier stage.

The alternative is the FOA process, which is already integrated in the idea generation phase. Here, the product development team is provided with information regarding possible infringement risks and possible unique selling propositions (USP). So, the FOA is both trying to avoid risks and to reach targeted exclusivity of the product. During the innovation process the product becomes more and more specific and the FOA process must follow this concretization of the product. This may cause a drastic decrease of the needed IP rights to ensure exclusivity during the product development process, since the potential number of critical components of the product which must be protected might decrease once the product features are defined very narrow. Nevertheless, this also means, that the analysis in the later stages should be more precise compared to the earlier stages, where only a broad overview of the state of the art is necessary to identify areas, where exclusivity through IP rights may be reached.

The integration of IP into the innovation process should be done with a focus on the effectiveness and efficiency of the FOA process. This is necessary, since innovation projects are complicated, expensive and the scope of the process, including possible infringement risks, constantly changes. For this purpose, binding rules along the innovation process must be defined outside the IP department, especially for the following areas:

- Definition of IP goals
- Responsibilities
- Process quality
- Structure of the strategic levels
- Risk management
- Level of formalization
- Budgeting

Chapter 2 | Ideation and scoping

Ideation or discovery

The first pre-phase of the stage-gate process is the ideation or discovery phase. This phase is crucial since a large amount of ideas is needed which can be assessed and refined in the innovation funnel. Only with enough ideas a successful market launch is possible in the end. The ideation process can be split into two groups. The first group is the idea collection. Here, ideas from publicly available material are gathered and put into a new context. This process is resource saving, fast and avoids the reinvention of something already existing. The second group is the generation of ideas. Here, absolutely new ideas are generated from scratch. Also, the sources of the new ideas can be split into two different groups, namely internal and external sources. The internal sources are the R&D department and employees. The external sources are customers, distributors, suppliers, competitors, and IP analyses.

As internal sources of ideas the employees have different channels to gather new ideas depending on their role in the company. For example, the marketing and sales department has a constant contact with the customer and can develop new product ideas through that intense customer contact. This has also the advantage, that the customer is in the focus of the new product development. In a similar way, the maintenance personnel can gather ideas about the improvement of products and services, since they exactly know, when customers experience problems with the products and services. With that knowledge they can search for innovative solutions.

The R&D department has in the process of idea generation a more inward-looking perspective. They know exactly the technological state of the art and potential to innovate not only in the own company, but also in their technological market segment. In a modern team-based innovation approach, the multiple internal sources from each department join forces to bundle their knowledge about technological feasibility, the market environment, and the customer needs.

The first external idea source are naturally the customers, who finally will buy the product. A company can get information from the customers in various ways. One way is e.g. the use of focus groups. Focus groups are moderated discussion groups, where a moderator guides the discussion to get concrete information about the customer needs of the group. In these groups nobody from the product development takes part to avoid biased outcomes. Other ways to integrate customers are lead users or design thinking methods, where the customers are directly integrated in the product development process (see "predicting technology change" -> Integrated IP and Innovation management: Part 2 Chapter 5). Another external idea source are the distributors and suppliers. They can get information along the value chain, which is driving innovation more and more, since the digital transformation causes the development of business eco-systems. This can be seen for example with the digital twins and their integration in the value chain at Rittal (see Additional Material).

The observation of competitors can also be used for the idea generation. Nevertheless, only publicly available material from the competitors can be used. This material can be used to understand market trends and the positioning of competitors.

Finally, IP analyses can be used for idea generation. This is useful, since from the publicly available data the positioning amongst the competitors in the market can be planned by the identification of empty spots, where exclusivity through the generation IP can be reached. Also, new market trends can be identified from the IP analyses.

The four stages of creativity

For the generation of ideas not only the internal and external sources of ideas are critical but also creativity. The modern concepts behind creativity were developed by Graham Wallas an English social psychologist in his book "The art of thought" from 1926 (see Figure 6). There he defined the creative process as a four-stage process with conscious and unconscious subprocesses. The four stages are: preparation, incubation, illumination, and verification (see Figure 7).

Figure 6: Graham Wallas. Source: *https://en.wikipedia.org/wiki/Graham_Wallas#/media/File:Graham_Wallas.jpg*

In the preparation phase external knowledge is taken up from all possible sources and logical and analytical reasoning is used to understand the problem space. Then, in the incubation phase the problem is processed by the unconscious parts of the mind without any active thinking. The next phase is the illumination phase, where the thinker has the eureka moment and the new idea is combined from conscious and unconscious processes in the mind. Finally, the idea has to be verified and actively formulated.

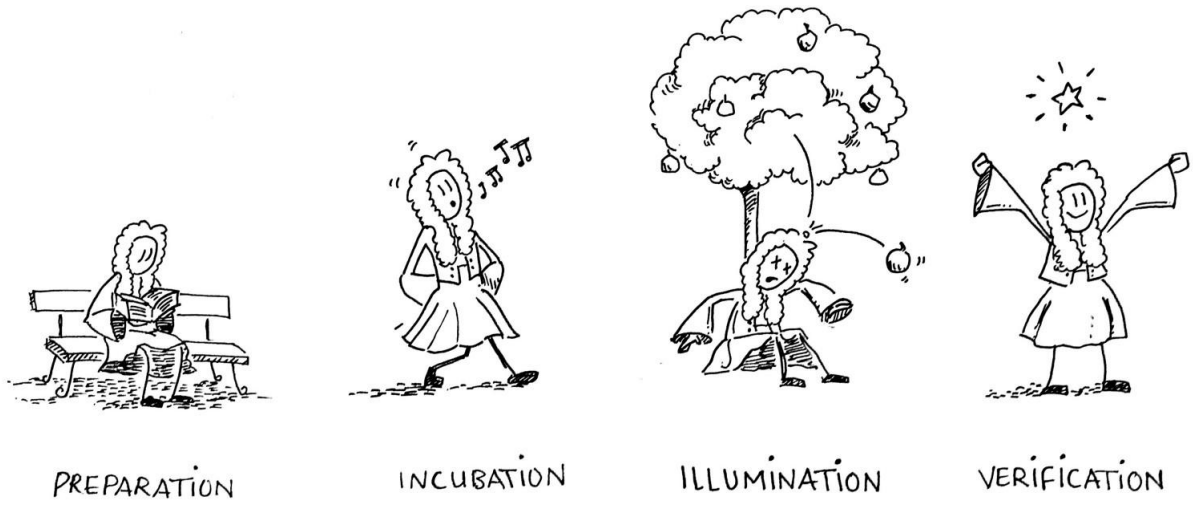


Figure 7: The process of creativity. Source: *https://blog.prototypr.io/creativity-science-for-designers-part-2-1884705bea0f*

Ideation methods

To foster the creativity of the ideation team and to generate new ideas, many creative thinking techniques can be applied. The most famous method for idea generation is the brainstorming method. Brainstorming is a group method, where an interdisciplinary team meets to generate as many wild ideas as possible. This is done in an environment, where critic is absolutely prohibited, that also the most ambitious ideas can be presented. The participants should instead of criticizing, build up on each other's ideas. Nevertheless, the ideas should stay within the beforehand defined scope of the brainstorming session.

An extension of the brainstorming approach is the SCAMPER method designed by Bob Eberle. The seven steps have the purpose to view the problem from different angles and get new thoughts and innovative ideas (see "The innovation funnel" -> Integrated IP and Innovation management: Part 4 Chapter 5).

Another approach is the opposite thinking method, which tries to force participants to think in unconventional ways. Here, the participants formulate assumptions they have and try to think about what a solution to the problem would be, when exactly the opposite of their assumption would be true.

Search field analysis

Although the idea generation phase should generate as many ideas as possible and also wild ideas, the search field for ideas should be limited to stay focused and avoid the ideation of ideas, which are not useful for the company e.g. because they do not fit into the business strategy. This process of narrowing down the field of ideas can be done with the help of a search field analysis. A search field analysis should on the one hand focus on the market needs and trends and on the other hand it should focus on the customer needs, so that products can be developed, which fulfill that needs. Also, the search fields must be matched with the overall business strategy of the company to only create ideas, which fit to the strategy. Nevertheless, the search fields must not be too narrow in the first place to allow the creation of many ideas.

An important perspective in the search field analysis is also the integration of IP. This perspective can be integrated for example with a freedom of action (FOA) process. This is important, because in the search field analysis fields with a high accumulation of third-party IP rights should be avoided in the new product development and fields with low patent activity can be used to create exclusivity. Also, the integration of IP in the search field analysis ensures, that the IP, innovation, and business strategies stay aligned.

The scoping phase

After the definition of search fields and the generation of ideas, the management team decides, which ideas pass the first gate and reach the scoping phase. In the scoping phase the team analyses the proposed ideas for their feasibility and marketability and specifies the

key concepts. This is supported by an analysis of the market environment with readily available material. A typical method to identify the strengths, weaknesses, opportunities, and threats of the ideas is the SWOT analysis (see "SWOT analysis" -> IP strategy Development: Part 7 Chapter 2) which can be used as a decision basis for the management team to decide which ideas should progress to the next stage and which ideas should be killed.

The SWOT analysis is a scan of the internal and external environments of the firm. Factors considered as internal to the firm can be classified as strengths and weaknesses, while those which are external to the firm can be classified as opportunities and threats. A SWOT matrix is often used to organize items identified under each of these four elements. A SWOT matrix is usually a square divided into four quadrants, with each quadrant representing one of the specific elements (see Figure 8). SWOT analysis can help the decision-making process by creating a visual representation of the various factors that are most likely to impact the successful implementation of an idea.

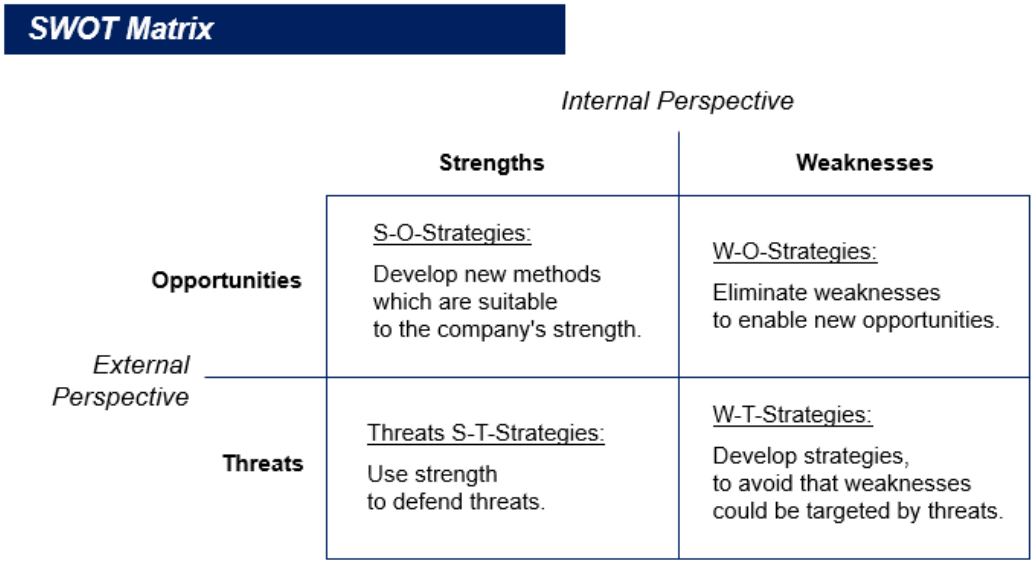


Figure 8: A SWOT matrix.

Chapter 3 | Business case building

The second phase of the stage-gate process

After the ideation and scoping phases ended the management team decides, which ideas should progress to the business case building phase. The business case building phase is also dedicated to the development of a concept, but more detailed and precise compared to the scoping phase. It is split into 4 subsegments:

- The definition and analysis of the product and project
- The building of the business case
- The building of the project plan
- And the feasibility study

Product definition and analysis

The first step to concretize an idea, which survived the scoping phase, is to define the final product which should be launched and marketed. Here, the product definition includes amongst other product features the product concept, design, target market, pricing, and positioning strategy (see "What is a product?" -> Integrated IP and innovation management: Part 3 Chapter 1). It has to answer how the product fulfills the customer needs and adds value to the customer and if the product development is feasible. Also, the target market and costs for the product must be analyzed.

To support the product definition a product analysis should be conducted, which is looking at the already existing products on the market, so that a better solution and product can be defined for the customers. A product analysis investigates the chosen material, processing, economic and aesthetic decisions of a product developer. In a product analysis first, competitor's products are broken down to its individual components. So, for example a vacuum cleaner can be broken down into the hose, the motor, the filter, the bag, etc. The next step is to look how the product fulfills the customer needs from a cost and from a feature perspective. This means, especially that the product and brand fulfill their promises. From the cost perspective another question is, if the same product can be produced cheaper or with higher quality for the customer, when the design is modified. Also, the IP position of the competitive product should be analyzed to find out if IP protection and legal exclusification of a new product is possible.

One way to systematically answer the key questions of product analysis is to use the ACCESSFM questions (see Figure 9). The acronym stands for:

- Aesthetics: What is the product's appearance and why did the designers choose these materials, design, etc.? Who is the product made for? How could it be improved for the customer from a design and material perspective?

- Cost: Is the product cheap or expensive and if it is expensive, what is the reason? Is it expensive because of a strong brand or the used material?
- Customer: Who is the customer of the product? What is the buyer persona? Is the product design and ergonomics matching the buyer persona or could it be improved?
- Environment: Does the product harm the environment during production, use or disposal?
- Size: What is the size of the product? What is the influence of the size on the user and the usability? Can the size be improved?
- Safety: How safe is the product to use for the end customer?
- Function: What is the primary function of the product and its primary purpose? What are additional functions? How good does it fulfill its functions and how could they be improved?
- Material: What materials is the product made of? What is the quality of these materials and could other materials be more suitable?

Figure 9: The ACCESSFM criteria in product analysis. Source: *http://gcseproductdesign.weebly.com/product-analysis.html*

An example of successful product analysis is the introduction of bagless vacuum cleaners by James Dyson. He found out that the traditional vacuum cleaners loose suction after some time due to the clogging of the dust bag. With the introduction of the cyclone technology in vacuum cleaners he transformed the design of the vacuum cleaners and avoided the suction loss. So, from a product analysis point of view he fulfilled the customer's need by avoiding the clogging of their vacuum cleaners. The use of the cyclone technology in the vacuum

cleaner improved the function, modified the aesthetics, and made the product environmentally friendlier by getting rid of the dust bags. From a cost perspective, the power and efficiency of the vacuum cleaner is particularly emphasized and anchored as a brand promise. The overall design of the device aims to show potential customers the superior power of the vacuum cleaner justifying premium prices. Here, also the strong IP position must be mentioned, which guarantees the exclusivity of customer relevant features and helps the company to enforce premium prices.

Patent analysis and use cases

Additionally, to a product analysis which focusses more on technological details, a patent analysis can also be conducted to analyze use cases. Traditionally, patent analysis is focused on the analysis of technological details to understand the portfolios of competitors. This helps in developing the own strategy and gives the opportunity to strategically position the own company.

Nevertheless, patent literature can not only be used for a technical analysis but also the analysis of concrete use cases. Looking into patent documents we may understand how technology is applied in a concrete use case and may also be able to understand the whole business model for which the patent was filed. This is a special characteristic of digital patents, where the technology is not the main driver of the patent filing, but the application in a use case based on the technology. So, a company wants to sell a product in a concrete use case and files a patent in a way, that it creates an exclusivity for that specific use case.

One concrete example is the licensing program of Signify, which is the lighting department of Philips. In their extremely successful licensing program Signify makes its developed technologies for very concrete use cases available in the market. One of these concrete patented use cases is the use of sensors attached to the lighting system to monitor the occupancy of the rooms of an office building to plan evacuations. This is shown in the patent WO2018141664 (see Figure 10). Here the occupants are shown the optimal escape route based on the monitored occupancy conditions with the help of the lighting system which makes fire drills less relevant. So, the core of this digital patent is not the used technology in the lighting system, but the concrete application to the evacuation use case.

Building of the business case

Based on the product definition the business case for the individual project can be built. The point of the business case is to provide decision-makers with the reasoning behind the project and the information needed to choose from multiple options. A business case examines the business aspects, risk, and financial investment in a product to help the decision-makers to choose the best option. A business case does not have any fixed structure, but several elements should be part of every business case. The most essential elements are:

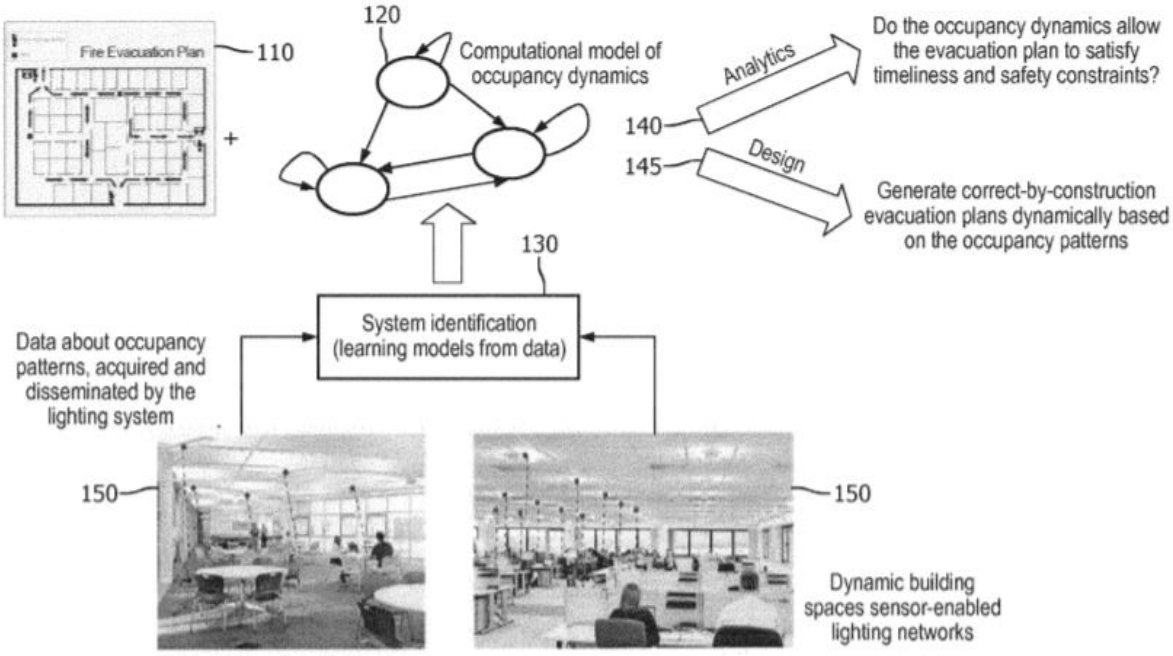


Figure 10: The WO2018141664 patent "A LIGHTING ENABLED SYSTEM AND METHODS FOR BUILDING EVACUATION PLANNING". Source: *https://worldwide.espacenet.com/publicationDetails/originalDocument?CC=WO&NR=2018141664A1&KC=A1&FT=D&ND=&date=20180809&DB=EPODOC&locale=de_EP*

- The executive summary
- The background
- The assumptions
- The costs
- The benefits
- The financial analysis
- The risk analysis
- The conclusion
- And the recommendation

The executive summary: The executive summary is a short and dense piece of information for the decision-makers. In many cases this is the only part of the report that is really read by the executives. It should summarize the business problem, the available options to choose from and a reasoning which option to choose. So, it should answer what should be done, why and by whom it should be done, and present the financial aspects of the project. The executive summary should not be longer than a page and may include a key figure to present the key features of the business plan.

Background: An important part of the business plan is the explanation of the background. The background helps to give the stakeholders basic information about why the project should be done and what is the subject of the business plan. This ensures, that everyone argues on the same basis and intersubjectivity in the decision-making process can be

reached, i.e. everyone come to the same result which business plan is the best, because everyone follows the same already formulated way to argument. The subject in the business plan is defined by the actions which should be taken and the business objectives which should be reached by it. This ensures, that the project is also aligned with the overall business strategy. Part of the background can also be a presentation of alternatives, especially when the business plan is competing with other busines plans to reach the next stage in the stage gate-process.

Assumptions: Every business plan is based on the assumptions of its builders. To convince the decision-makers about the sound argumentation of the business plan all assumptions have to be properly written down and presented. So, for example the assumed market development and price development in the future can only be an assumption. The chosen numbers of the expected development which are used in the case must be presented and an argumentation must be given why those numbers were chosen. Also factors like the dependency of the project's success on e.g. suppliers should be made clear. The list of assumptions may grow over time and the information basis may change during the project. Therefore, a sensitivity analysis of the assumptions should be conducted to assess the risk of the uncertainty of the assumptions.

Costs: An important point for the decision-makers is the cost overview of the project. Here, all relevant costs from the development costs of the product to the maintenance costs and from the material costs to the labor costs should be considered for the chosen business scenario. Costs include also the savings of costs.

Benefits: Additionally, to the costs of a project, there are also benefits to a company. Those benefits are helping to achieve the company's goals and objectives. Here, again the business plan must be aligned with the overall business strategy and the decision-makers can decide on the continuation of projects based on their impact on the defined business objectives. The business objectives of the company should already be stated within the business case in the background section.

Financial analysis: Based on the costs and benefit a detailed financial analysis must be performed to visualize the short- and long-term financial value of the project and the development costs. This is needed for the decision-makers to judge if the project should be funded or not. For the financial analysis of the project, typically a cash flow statement must be provided which lists the cash flow in and out of the company.

Risk analysis: Each project has its internal risks and a clear and detailed description of that risks is vital to make a decision about the continuation of the project. Therefore, the risk relevant features must be determined by a risk and sensitivity analysis. The risk analysis assesses the uncertainty of the activities and the related cashflows in a quantitative and qualitative way. Quantitative methods are for example Monte Carlo simulations which use random numbers to generate probability distributions of possible outcomes. Qualitative methods are for example a SWOT analysis ("SWOT analysis" -> IP strategy Development: Part 7 Chapter 2) to analyze strengths, weaknesses, opportunities, and threats.

Conclusion: In this section the drawn conclusions of the authors of the business plan should be justified against the decision-makers. This includes the presentation of all decision relevant results and analyses presented earlier in the business plan and the justification that the project can reach the outlined business objectives defined in the business strategy based on the presented business plan.

Recommendation: Finally, a short recommendation statement should be given to the decision-makers. The statement should comprise the recommended decision, the risks of the project and the business objectives which should be achieved.

The business model canvas

An additional useful tool for describing, developing, and analyzing the business model of an organization is the business model canvas developed by Alexander Osterwalder. In the business model canvas 9 different building blocks of a business model can be systematically analyzed. Those 9 building blocks are:

- The cost structure
- Key partners
- Key activities
- Key resources
- The value proposition
- Customer relationships
- Channels
- Customer segments
- And revenue streams

The segments are logically ordered in the business model canvas based on the market and resources sides (see Figure 11). The resource side elements are on the left side and the market side elements are located on the right side, while the financial perspective is located on the bottom of the business model canvas. The resource-based element are the key partners, key activities and key resources in the business model and the related cost structure. The market-based elements are the customers segments, customer relationships and channels as well as the related revenue streams. The link between each side is the value proposition, which is describing the value the company is offering to the customers compared to the competition.

Building of the project plan

After the business case is built the next step is to build a concrete project plan. Compared to the business case the project plan does not give recommendations on the project but outlines the ins and outs of the project and provides a concrete timeline. It does not target the decision-maker, but the stakeholder who should execute the project. Finally, the focus of

the project plan is compared to the business plan narrowed down to the concrete project execution (see Figure 12).

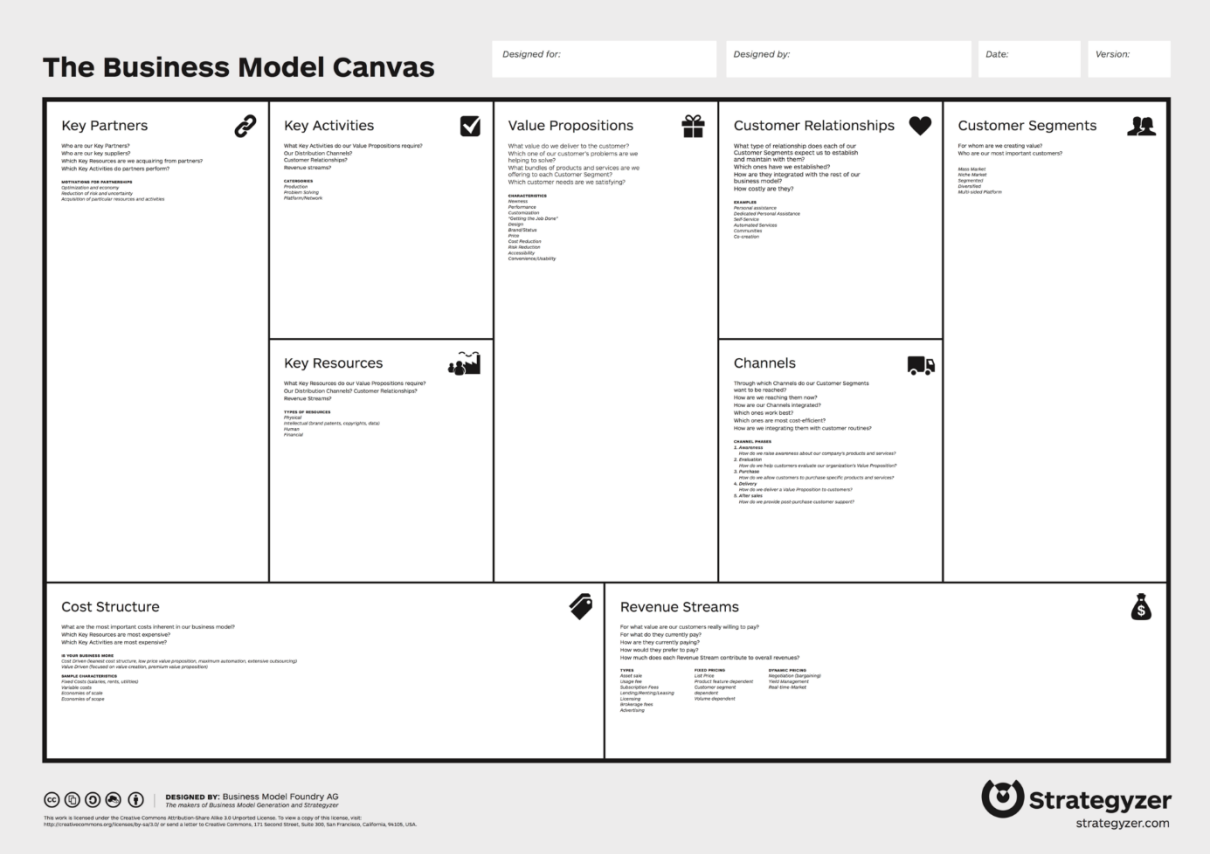


Figure 11: The business model canvas. Source: *http://www.businessmodelalchemist.com/tools*

	Business case	Project plan
What for?	Business cases come before project plans. They present high-level options of what the project might look like and make recommendations on how the business should proceed.	Project plans begin after a business case has been finalised. They present the practical ins and outs of the project, including how it will proceed and according to what timeline.
Who for?	Business cases are presented to the relevant internal stakeholders, including someone who can give budget approval.	Project plans are presented to project managers and any other stakeholders involved in the project's delivery.
Focus?	Business cases have a broader focus: what the project might look like.	Project plans have a narrower focus: exactly how the project will proceed.

Figure 12: Comparison between business case and project plan. Source: *https://online.jcu.edu.au/blog/how-to-write-business-case*

The Project Management Body of Knowledge (PMBOK) definition of a project plan is: "A project plan is a formal, approved document used to guide both project execution and project control. The primary uses of the project plan are to document planning assumptions

and decisions, facilitate communication among project stakeholders, and document approved scope, cost, and schedule baselines. A project plan may be summarized or detailed."

As the definition by the PMBOK says, the project plan can have different degrees of detail. The minimum requirements of a project plan can be broken down to these four question types which should be answered:

- Why? Why should the project be realized? What problem should the project solve and what is the value proposition?
- What? What should be done in the project? What are the major products, goals, deliverables, and outcomes of the project?
- Who? Who will be involved in the project, what are their responsibilities and how are they organized?
- When? What is the project schedule and what is the project timeline? What are the important milestones during the project and when are they scheduled?

For the visualization of a concrete project plan the timeline and milestones of the project need to be broken down. A typical visualization of a project plan in a so-called work breakdown structure is the Gantt chart. This type of chart was developed by Henry Gantt (see Figure 13) in the 1910s to schedule and break down tasks and activities versus the project timeline. The timeline goes on the chart in the horizontal direction and the tasks and activities are ordered in the rows below (see Figure 14). Each activity is defined in the chart with a horizontal bar denoting its start and end date. Also, the relationship between activities can be shown in the chart. So, it shows which activity starts with the end of another activity.

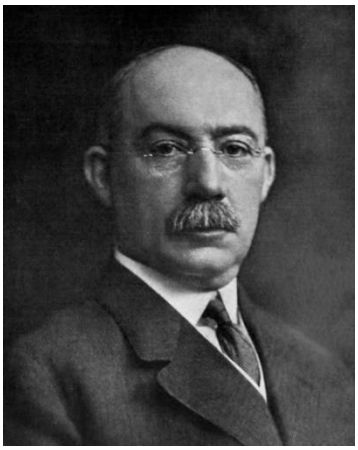
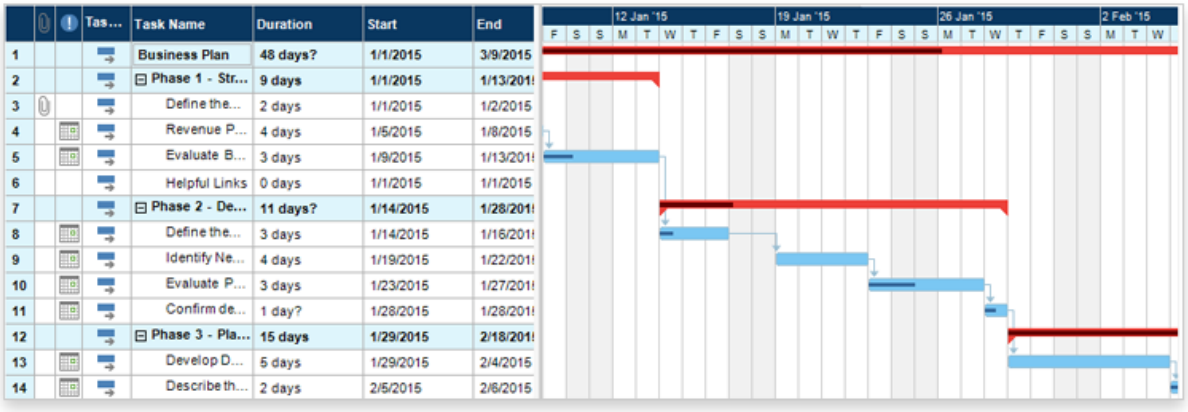


Figure 13: Henry Gantt. Source: *https://en.wikipedia.org/wiki/Gantt_chart#/media/File:Henry_L._Gantt.jpg*



	Tas...	Task Name	Duration	Start	End
1		Business Plan	48 days?	1/1/2015	3/9/2015
2		Phase 1 - Str...	9 days	1/1/2015	1/13/201
3		Define the...	2 days	1/1/2015	1/2/2015
4		Revenue P...	4 days	1/5/2015	1/8/2015
5		Evaluate B...	3 days	1/9/2015	1/13/201
6		Helpful Links	0 days	1/1/2015	1/1/2015
7		Phase 2 - De...	11 days?	1/14/2015	1/28/201
8		Define the...	3 days	1/14/2015	1/16/201
9		Identify Ne...	4 days	1/19/2015	1/22/201
10		Evaluate P...	3 days	1/23/2015	1/27/201
11		Confirm de...	1 day?	1/28/2015	1/28/201
12		Phase 3 - Pla...	15 days	1/29/2015	2/18/201
13		Develop D...	5 days	1/29/2015	2/4/2015
14		Describe th...	2 days	2/5/2015	2/6/2015

Figure 14: A Gantt chart. Source: *https://www.gantt.com/*

The feasibility study

After the project plan is outlined, the feasibility of the plan must be assessed. This can be done with a feasibility study. A feasibility study asks the question, if the outlined project plan and business case are actually successfully executable. What are the strengths and weaknesses and what is recommended to do? The feasibility study gives the decision-makers the necessary information to decide, which projects should be continued.
There are five areas of feasibility which should be addressed in a feasibility study. Those five areas are summarized under the acronym TELOS (see Figure 15):

- Technological feasibility
- Economic feasibility
- Legal feasibility
- Organizational feasibility
- And Scheduling feasibility

The technological feasibility asks the question if the product requirements can actually be technologically delivered. Is the company able to produce the product by itself or does it need components from a third-party? Do the employees have the skills and resources to successfully execute the project?

Economic feasibility asks the questions if the project is affordable and profitable. So, on one side it focusses on the cost perspective and on the other side on the benefit perspective. Here, it is to mention, that the profitability must be assessed compared to the other project's profitability to find the most profitable projects which should be continued and how the profitability can be optimized by IP?

The legal feasibility asks the question if the project is legally executable. This includes amongst other legal questions also IP questions. E.g. does the planned product infringe patents?

Operational feasibility asks the question if the project fulfills the outlined requirements and satisfies the identified market needs defined in the business case. It also examines the internal feasibility by assessing the influence on the daily routines and processes and the required training of the project team to successfully implement the project.

Finally, scheduling feasibility asks the question if the project can be completed in a reasonable time. This includes to estimate if the milestones and deadlines are reachable and not only if it takes too long till the project can be finished.

When those five categories of feasibility are assessed, all projects can be presented to the decision-makers, who choose based on the business plan, project plan and feasibility, which projects should pass the gate to the product development stage.

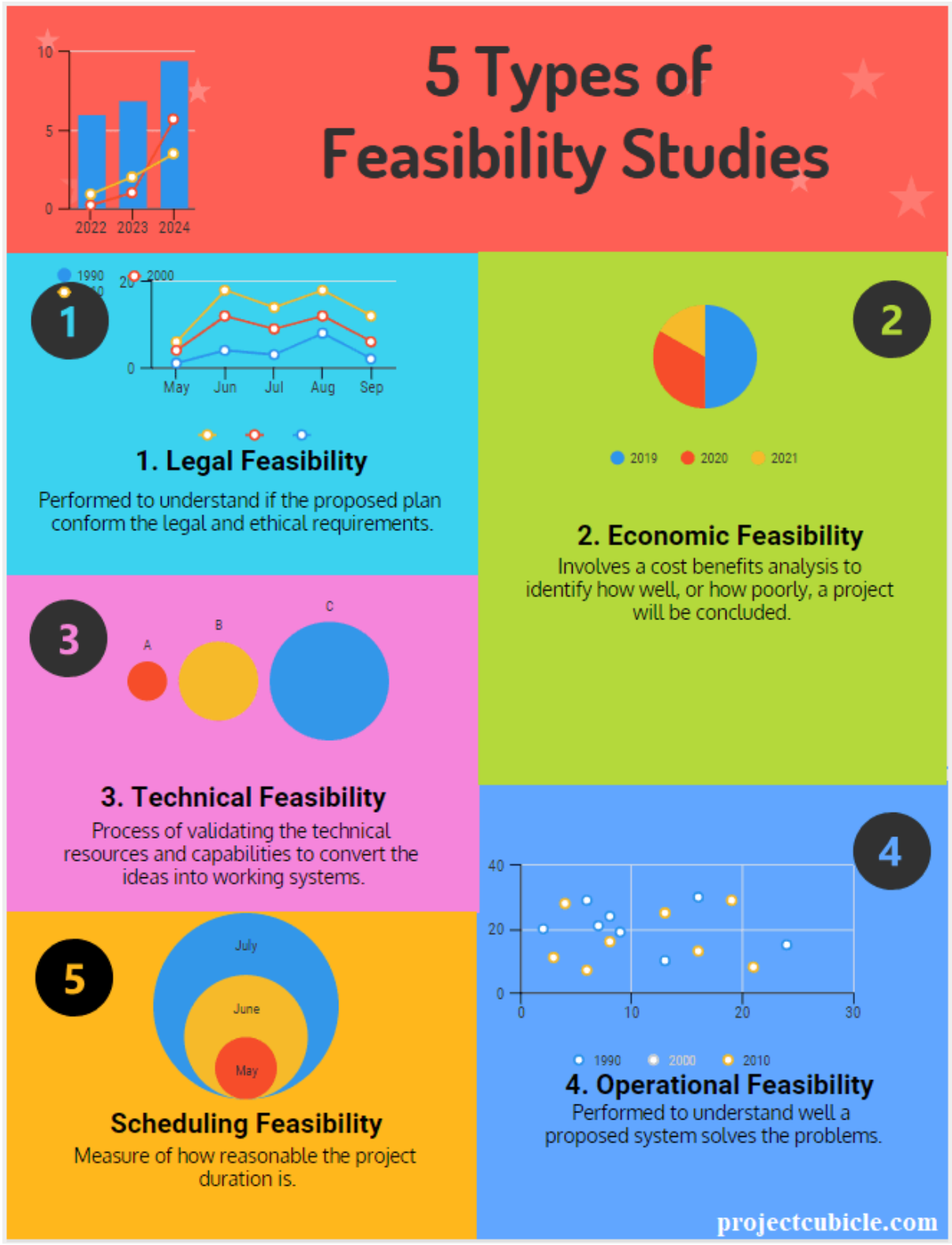


Figure 15: The 5 areas of feasibility studies (TELOS). Source: *https://www.projectcubicle.com/feasibility-study-in-project-management/*

Chapter 4 | Development, testing and validation

The third phase of the stage-gate process

After the decision-makers decided which projects should pass the gate from the business case building stage the most promising projects reach the development stage. In the development stage the development of a product starts based on the outlined business case and project plan. The core idea of the development stage is to create a working prototype. This prototype is at the next gate assessed by the decision-makers, who decide about the continuation of the project.

Categories of prototypes

The term prototype is not well defined and has different meanings in multiple industries. There is also a difference between classical engineering and software in the definition of prototypes. The term prototype can either refer to a first usable version of a product or it can refer to the whole development process from idea to the final product. The different definitions of prototypes can be categorized into five groups. Those categories refer to a different position in the product development process and different areas of application. Those five categories are (see Figure 16):

- Systemic software prototypes: This category refers to software prototypes. Those prototypes can either refer to the part or the whole of an interactive system. Therefore, systemic software prototypes cover the whole range from idea to new product.
- Divergent prototypes: Divergent prototypes refer to prototypes as a tool to learn. This is opposite to the more common definitions, which use prototypes as tools to produce one final whole product. Those prototypes are located early next to the idea stage.
- High fidelity prototypes: High fidelity prototypes are built as tools for testing and as quality control for the made decisions. They are located close to the final new product.
- Validation prototypes: Validation prototypes go even a step further and serve as a tool for decision-making. The prototype helps here to assess the risks and expenses a last time before the final commitment to the project. It is located next to the final new product.
- Total prototypes: Total prototypes cover the whole range of product development. They can be first sketches or whole products.

Prototyping approaches

There are different approaches in refining the prototype until it reaches a degree of functionality, which can be assessed by the decision-maker who chooses if more should be

invested into the project. The main two approaches are the iterative prototyping and the parallel prototyping approach.

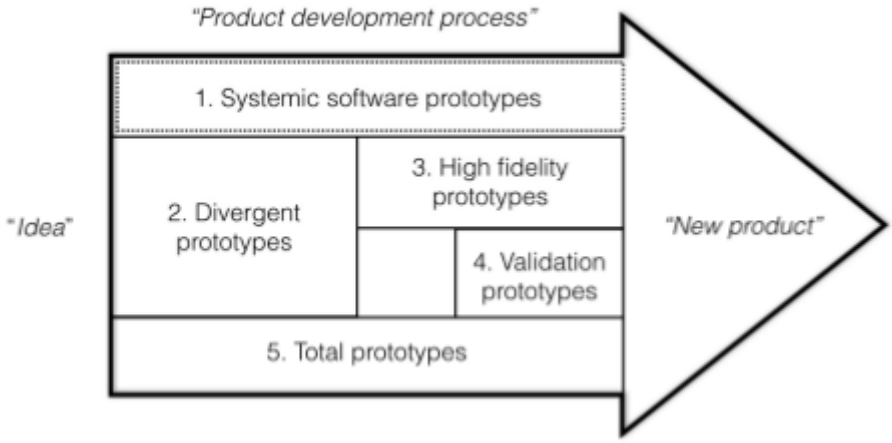


Figure 16: The five types of prototypes. Source: *L. S. Jensen, A. G. Özkil and N. H. Mortensen, 2016, PROTOTYPES IN ENGINEERING DESIGN: DEFINITIONS AND STRATEGIES, Proceedings of the DESIGN 2016 14th INTERNATIONAL DESIGN CONFERENCE - Dubrovnik - Croatia, May 16 - 19, 2016.*

The iterative prototyping approach aims a gradually improving a prototype. One prototype is developed and improved through continuous testing. During testing the achievement of the product requirements is controlled and the number of iterations can be chosen in an agile manner. Typically, the iteration cycles become shorter with each iteration. The prototyping is finished, when the performance of the prototype cannot be improved by more iteration cycles with reasonable cost.

The parallel prototyping approach in contrary investigates multiple prototype designs in parallel. Here, the multiple prototypes are compared with each other to find the most promising design approach. The parallel prototyping approach is more costly, since multiple designs need to be produced, but also tends to produce better designs compared to iterative prototyping.

A comparison between both prototyping approaches shows, that iterative prototyping tends to find only local optima of designs, while parallel prototyping has a better chance to find the global design optimum (see Figure 17). This can be explained by the different ideas behind the two approaches. The iterative approach looks only for a gradual improvement but sticks with the initial design and product idea, so only the best solution close to the initial design can be found. The parallel approach investigates a huge spectrum of possible designs and by this approach also the optimal designs of the prototype can be found.

Low fidelity vs. high fidelity prototypes

Another dimension in the development of prototypes is the prototype fidelity. Fidelity means here the degree of functionality, which the prototype has. Also, the details of the

prototype increase with the fidelity (see Figure 18). The needed degree of fidelity depends on the project stage and the needs to convince the decision-makers to continue the project.

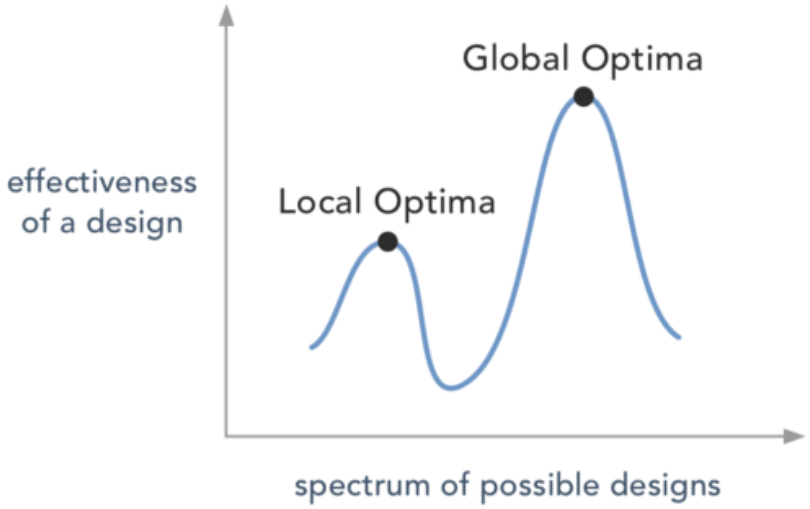


Figure 17: Comparison of iterative prototyping (left) and parallel prototyping (right) to find effective designs. Source: *https://medium.com/ucsddesignco/iterative-vs-parallel-prototyping-575d455da5b5*

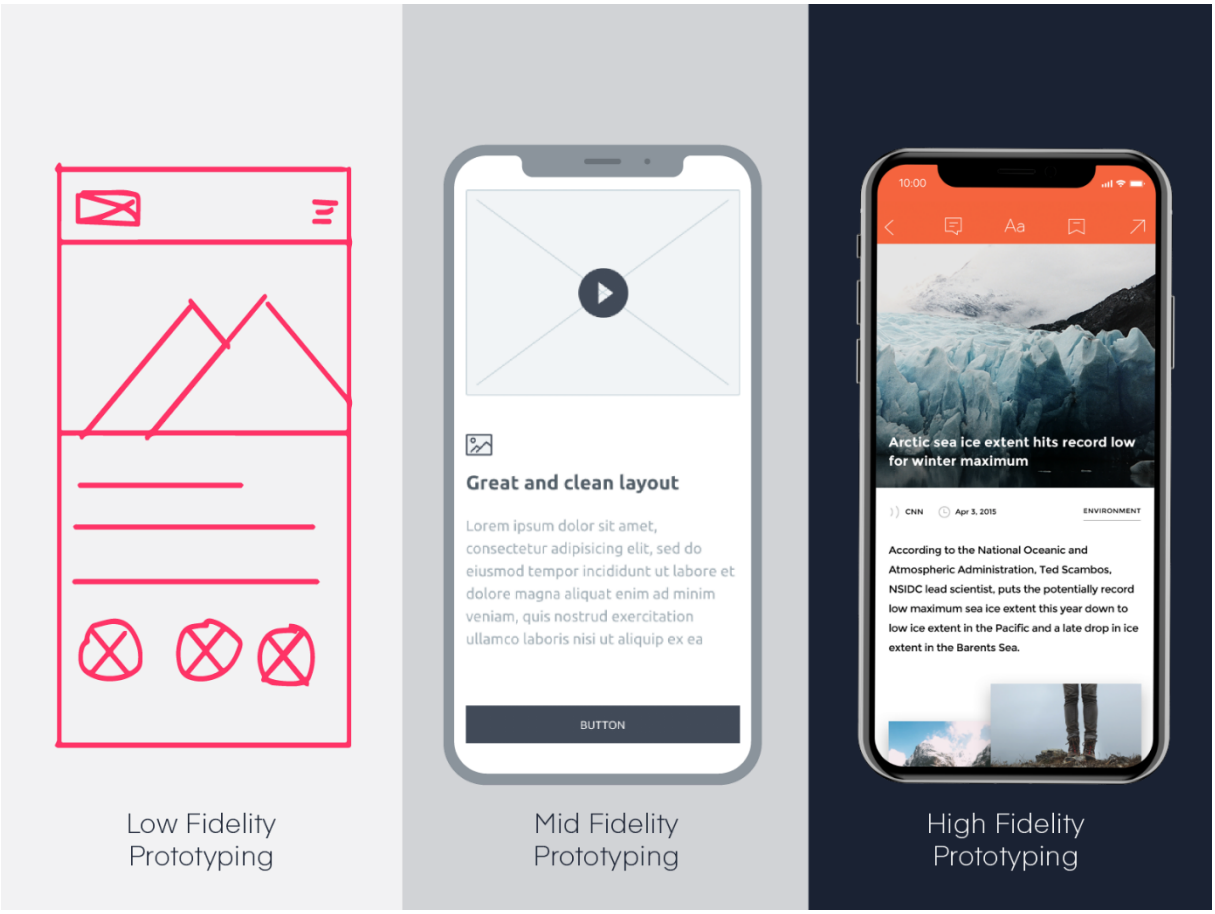


Figure 18: Low, mid and high-fidelity prototypes. Source: *https://www.invisionapp.com/design-defined/prototype/*

Typical low fidelity prototyping techniques are paper prototypes. Paper prototypes are for example paper mockups, where a product is constructed as a paper model or a digital interface is sketched on paper. This low feasibility testing is a fast and cheap method to investigate the usability of the product. Practically, this approach is mostly used in software prototyping but can also be used for classical engineering prototypes.

For example, in software prototyping an exercise app for a mobile phone can be prototyped with a paper prototype (see Figure 19). Here, the user interfaces of multiple menus are just painted on pieces of paper and also the smart phone case is created from paper to imitate the real user experience as close as possible. Then also smaller elements for example the components of drop-down menus and other menu elements can be created directly from paper to simulate the scrolling through menus. This way the full functionality of the final app can be simulated just with paper and the usability can be tested.

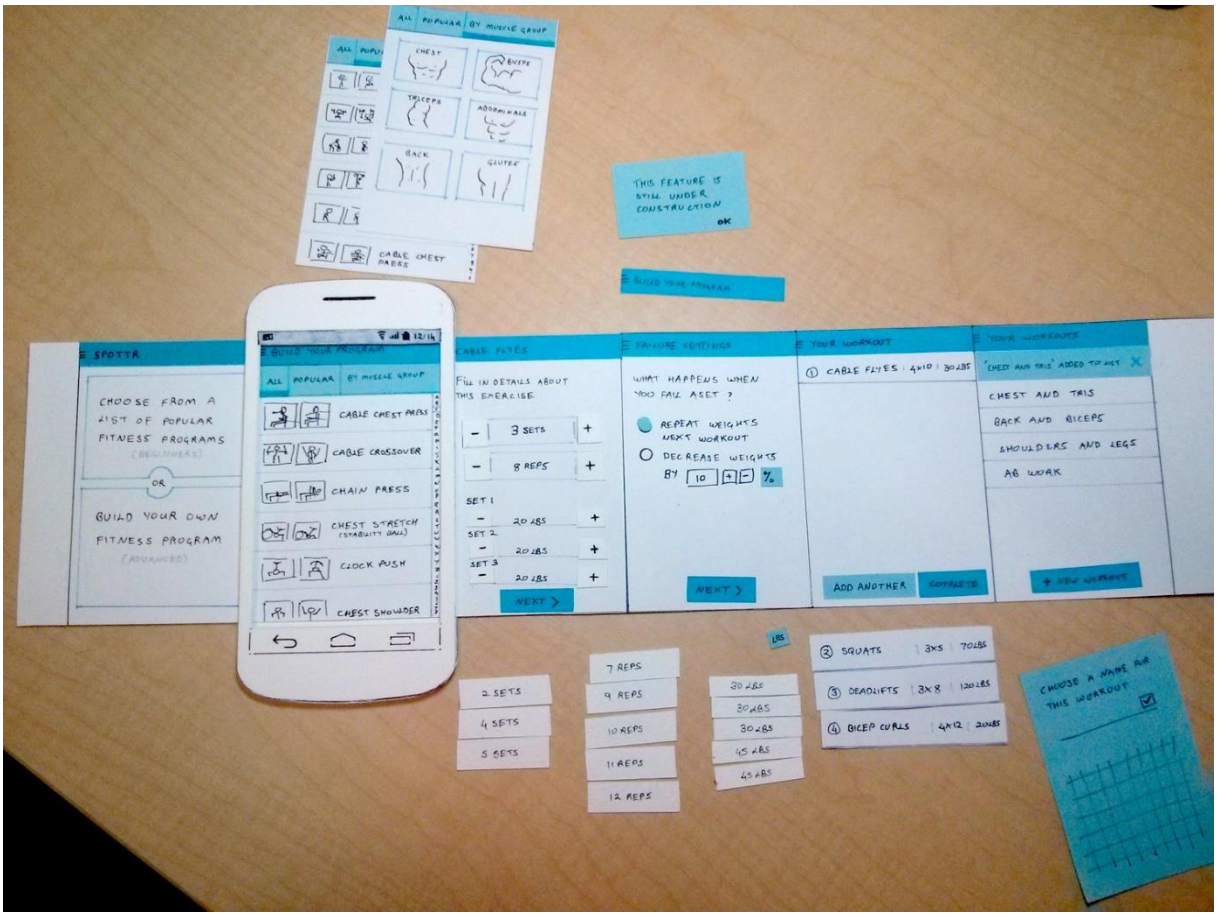


Figure 19: A paper prototype. Source: *http://aaronbrako.com/prototyping*

High fidelity prototypes have basically the same interactivity with the user like the final product. They have a degree of detail and design comparable to the finally shipped product. Also, the content of high fidelity prototypes is similar to the finished product. The typical way to create high fidelity software prototypes is the building of a digital prototype with a suitable software. Like for low fidelity prototypes the user behavior of the test subject must be observed and documented for improving the prototype.

During this product development stage only alpha or lab testing takes place. Nevertheless, the testing results must be promising enough that the decision-makers at the end of the product development stage are positive to let the prototype pass the gate. After it passed the gate the prototype reaches the testing and validation stage. Here, the testing with real customers, the so-called beta testing begins.

Testing and validation

Once the prototype is working and the alpha testing in the lab environment showed promising results the testing with real customers starts. Here two testing stages with different purposes can be distinguished:

- Beta testing
- And market testing

Beta testing is a product testing stage. It is similar to the in-lab alpha testing of the product, but it is done with real customers. Here, a feedback of the testers is expected to improve the product. Market testing is explicitly performed without user feedback, but it is about the planning of marketing scenarios and deciding which scenario is the most promising. Here, the marketing of the product is in the focus, not so much the improvement of the product.

Beta testing

Beta testing is a testing stage, where a product with already fully defined functionality and usability is the first time tested with a real customer. So, beta testing happens pre-release to the market. This stage is reached after all major defects of the software, product or service were removed by the internal alpha testing team.

The beta testing stage has multiple purposes. It serves as a test of the accessibility, usability, reliability, and functionality of the product or service. The beta testers are usually customers who get an early access to the product. This is especially done in software development, where they get a free trial version of the software. The beta testers are then expected to report issues with the product or service, which can be fixed before the launch of the product.

Conceptually, there are two different approaches to beta testing namely the closed and the open beta testing. In short, the closed beta testing is conducted with only a limited number of invited testers, while the open beta is open for the whole public and everyone can participate. They have different advantages and disadvantages. The closed beta is more suitable, when the product should not be known to the broad public early on. Also, when the product should be tested with a special focus, a well selected testing group is needed to give precise feedback. Open beta testing in contrast has the advantage to reach many testers at the same time, which is very useful in software testing, and a diverse set of testers can be recruited with a broad variety of different living environments. That way the

feedback can be more diverse and realistic compared to a closed beta testing. Finally, open beta testing informs the broad public, that a new product will be released soon and creates attention for that product. Nevertheless, in an open beta potential customers could also be angered by showing them a not yet ready product. For that reason, a closed beta testing might be better in some cases.

Historically, beta testing originated in the software industry. One example for open beta testing is the beta testing phase of the Windows Vista operating system between 2005 and 2006 (see Figure 20). In 2005 Microsoft started a beta testing program with more than 100.000 beta testers. In 2006 a second beta version was made available to the public with improvements based on the feedback of the beta testers. This version was downloaded and tested by more than five million testers.

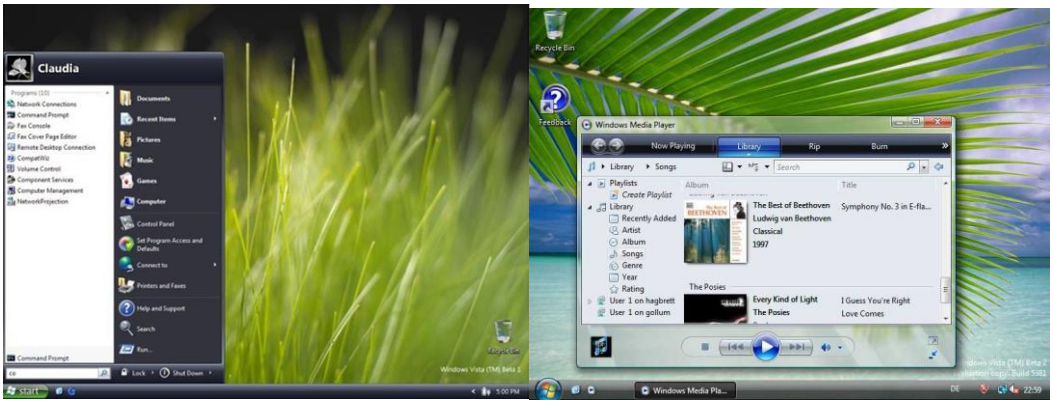


Figure 20: Beta 1 (left) and beta 2 (right) testing versions of Windows Vista. Source: *https://www.chip.de/artikel/Windows-Vista-Beta-1-Neue-Funktionen-und-Highlights-3_139972263.html and https://www.heise.de/newsticker/meldung/Windows-Vista-Weitere-Vorabversion-fuer-Beta-Tester-122797.html*

Market testing

The final testing stage is the market testing. In market testing different marketing scenarios are developed and tested in the market to identify the most promising marketing scenarios before the full roll out of the product. So, market testing is not focusing on the improvement of the product, but the marketing of the product.

The classical market testing in the market for fast moving consumer goods is the selling of the new product in small scale test markets. Here, the idea is to test the marketing concept in the same way, in which it should be implemented at the full scale roll out. To do so, it has to be decided, what should be tested in the test market. So, typical questions are:

- What should be tested?
- What are the success criteria of the test?
- What test market is suitable?
- And how long should the test be conducted?

One way of testing is to modify the marketing mix (see "Product Life Cycle and Marketing Mix" -> Integrated IP and Innovation management: Part 3 Chapter 2) in different test markets and compare the product performance. The typical marketing mix of the 4Ps consists of Price, Product, Promotion and Place and the 7P concept also knows the categories People, Physical evidence, and Processes. This way e.g. the pricing, the customer experience, the branding, and the promotion of the sold goods can be improved.

Nevertheless, the use of test markets has its limitations. First the market testing comes at a very late stage of the product development, so that the investment into the product or service is already huge and the relative potential benefit from a market test by reducing risk may be low. Also, the reliability of the market test may be low due to differences between the test market and the full market. Finally, the launch of a product or service in a test market gives the competitors information about the planned product launch at an early time.

Integration of IP in the innovation process

Of course, also in the concrete product development and testing stages the importance of IP must not be ignored. The customer relevant features which are identified in alpha, beta and market testing have to be IP protected to make the sold products and services unique. Only this way the product launch will be economically successful.

An example for the IP protection of all relevant key customer benefits is the Vorwerk Thermomix. Here, the IP strategy was consistently and systematically designed, so that it covers all key customer benefits in its proprietary IP portfolio. The IP protection of the Thermomix covers its look and feel. This means that competitors are excluded from using the central selling proposition of the Thermomix. It enjoys a high level of exclusivity in terms of those customer relevant features which are relevant for purchase decisions or recommendations (see case study Thermomix).

Chapter 5 | Marketing, launch and post launch review

The marketing plan

The last step before reaching the final gate and the final decision to launch the product in the market is made is the drafting of the marketing plan. This marketing plan has to be approved by the decision-makers before the launch. A typical marketing plan for a product or service consists of the following 8 chapters (see Figure 21):

- The executive summary: The executive summary is a small paragraph summarizing the goals and recommendations of the whole marketing plan. This is usually the only part, which the executives who decide will read.
- The current marketing situation: The current marketing situation is analyzed within a marketing audit. A marketing audit is a comprehensive, systematic, independent, and periodic analysis of the business marketing environment of an organization with the purpose to identify problems and opportunities. The analysis should be based on the overall goals and objectives of the company. The current marketing situation describes the target market for a product or service and the relative position of the company. This covers the areas of market, product, competition, and distribution.
- A SWOT analysis: The SWOT analysis investigates the strengths, weaknesses, opportunities, and threats within the defined target market and against the defined competitors (see "SWOT analysis" -> IP strategy Development: Part 7 Chapter 2).
- The objectives and issues: In this section the marketing goals and objectives are defined with their related issues. The best way to define them is based on the so-called SMART criteria. The acronym SMART stand for: specific, measurable, achievable, relevant, and time bound.
- The marketing strategy: Based on the previously defined marketing objectives the marketing strategy is defined to reach them.
- Action programs: The action program defines the concrete actions following from the marketing strategy. Those actions are based on the 4 W questions: What will be done? When will it be done? Who is responsible for doing it? What will it cost?
- The budget: Based on the action plan the costs and expected revenues can be determined. The difference between them is the projected profit-and-loss statement which serves as basis for budget decisions of the management.
- And controls: Here the conditions of the controlling of the plan is described.

Analysis of the macroenvironment

For the complete analysis of the current market environment multiple external aspects must be investigated. One of them is the external macroenvironment. The macro environment covers all external factors, which are part of the broader society. The factors are typically organized under the acronym PESTEL (see Figure 22). The PESTEL factors include:

- Political
- Economic
- Social
- Technological
- Environmental
- And legal factors

Section	Purpose
Executive summary	Presents a quick overview of the plan for quick management review.
Current marketing situation	The marketing audit that presents background data on the market, product, competition and distribution.
SWOT analysis	Identifies the company's main *strengths* and *weaknesses* and the main *opportunities* and *threats* facing the product.
Objectives and issues	Defines the company's objectives in the areas of sales, market share and profits, and the issues that will affect these objectives.
Marketing strategy	Presents the broad marketing approach that will be used to achieve the plan's objectives.
Action programmes	Specifies *what* will be done, *who* will do it, *when* it will be done and *what* it will cost.
Budgets	A projected profit-and-loss statement that forecasts the expected financial outcomes from the plan.
Controls	Indicates how the progress of the plan will be monitored.

Figure 21: Sections and purposes of a marketing plan. Source: *Kotler, P. et al. (1996): Principles of Marketing; Fourth European Edition Prentice Hall; Harlow (UK)*

Political factors are factors which depend on the government actions in a target market. So, the most relevant political factors are legal regulations of the economy, e.g. tariffs or government subsidies. But also, the stability of a political system can be relevant.

Economic factors are factors regarding the economic development of the target markets. This includes the market growth, the inflation and interest rates in a market, and the disposable income of the potential customers.

Social factors include factors dependent on the social structure in a target market. This includes population growth, family sizes, overall health and life expectancy, but also social norms, the local language and religious beliefs.

Technological factors include factors regarding the technological market environment. This is important for the production and distribution of the new products and the marketing communication with the customers. For all this the state of the technological infrastructure

of the target market is critical which can be assessed e.g. by the size of the R&D expenditures.

Environment factors depend on the environmental conditions in the target market. This can include the physical geography and the local climate, but also factors such as environmental pollution in the target market.

Finally, legal factors cover all relevant laws which regulate businesses in the target market. The legal factors also include of course IP laws. Additionally, not only the laws themselves but also the state of the legal system in the target market is important.

Sometimes also ethical factors are included in the list. This includes factors such as the corporate social responsibility of companies.

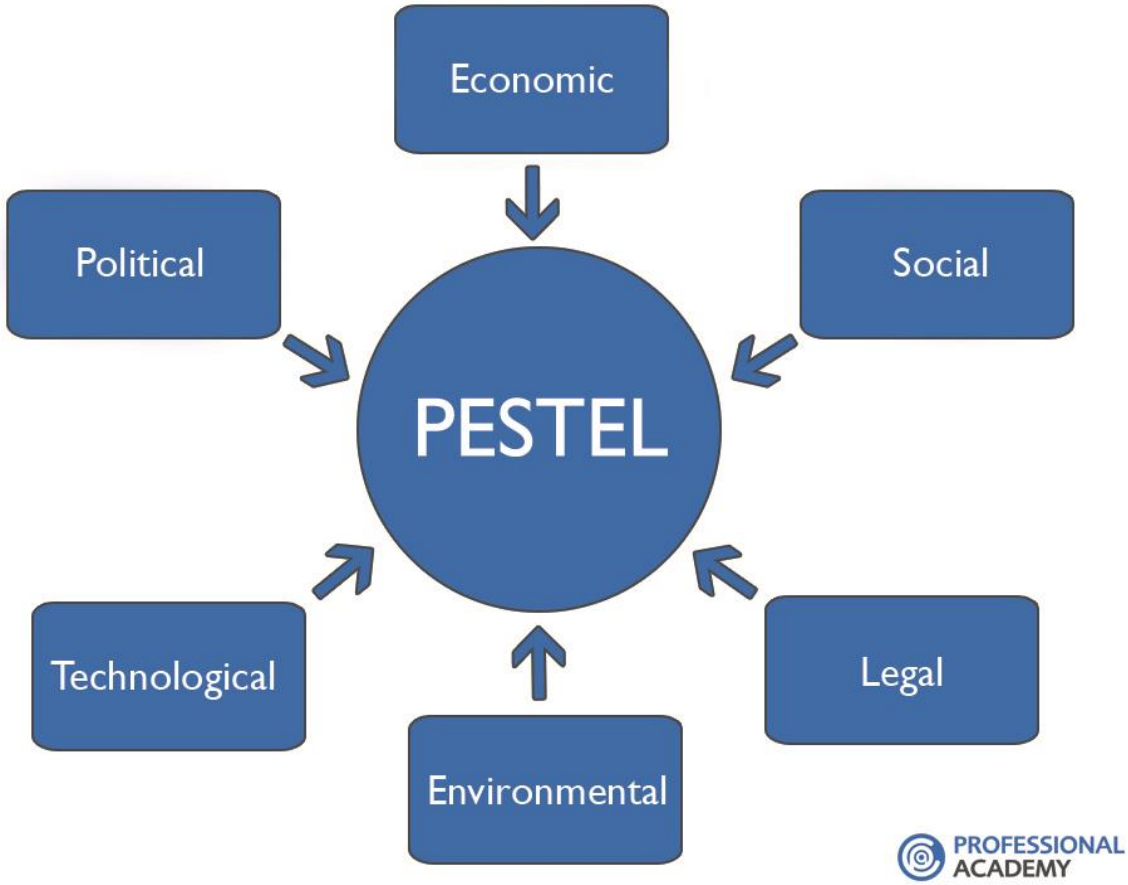


Figure 22: The PESTEL factors. Source: *https://www.professionalacademy.com/blogs-and-advice/marketing-theories---pestel-analysis*

Analysis of the microenvironment

Next to the macroenvironment also the microenvironment has to be assessed. This is necessary since the microenvironment close to the company is the most crucial factor to actually deliver the customer benefit to the potential customers. Therefore, the relationship between marketing and the microenvironment must be analyzed, so that customer

satisfaction can be reached. The microenvironment of a company consists typically of 6 areas (see Figure 23):

- The company itself
- Suppliers
- Marketing intermediaries
- Customers
- Competitors
- And the public

Figure 23: The microenvironment of a company. Source: *https://getmerit.wordpress.com/2015/10/17/the-marketing-environment-companys-microenvironment/*

The company itself: The crucial factor for marketing inside the company is that all relevant departments work together and are involved in the marketing effort. This includes for example product management, the R&D and IP department (see Figure 24). Like all other departments, marketing and the marketing strategy must be aligned with the overall business strategy to achieve the company's goals and objective and to deliver the customer benefit to reach customer satisfaction.

The suppliers: Companies are often dependent on their suppliers since they are providing crucial resources for the production of goods and services. The quality and reliability of suppliers and their products is therefore important for a company to deliver the promised customer benefit. Marketing has to monitor the development of both the quality of the supplier products and the price of products. Also, the risk of delays in the supply chain must be analysed.

Marketing intermediaries: An important role in the successful marketing of products play the so-called marketing intermediaries. Those are companies which help in promoting, selling, and distributing the products or services to the customers. They cover companies from

external marketing service agencies to retailers. For the successful creation of a positive customer experience with the product or service those marketing intermediaries are crucial because they have often the only direct interaction with the customer and serve as customer touchpoints.

Customers: The key point of any business is finally to sell products or services to a customer. Therefore, the factors, which regulate a customer's buying behavior must be understood by marketing. Those factors are different for each market type. For example, in the fast moving consumer good (FMCG) market the communication with the customer must be based on the brand promise. Therefore, the FMCG brands need a holistic brand strategy. They have to create brand values that go beyond mere product benefits and address the real needs of consumers.

Competitors: The marketing strategy within the overall business strategy must be chosen in a way, that competitive advantages arise through product differentiation. This means, that a company can produce their products or services better or cheaper than the competitors and generates more profit, because their product is seen as superior to competitors' products. That this marketing strategy works, it has to be supported with fitting IP measures.

The public: The public are all people who somehow care about the objectives of the company. The reasons can be very different. E.g. environmentalists could be interested that the company reaches their goals by creating minimal environmental pollution. This could influence politicians to make environmental laws stricter than before. That way the public can have an impact on the company, although they are not part of the buyer group.

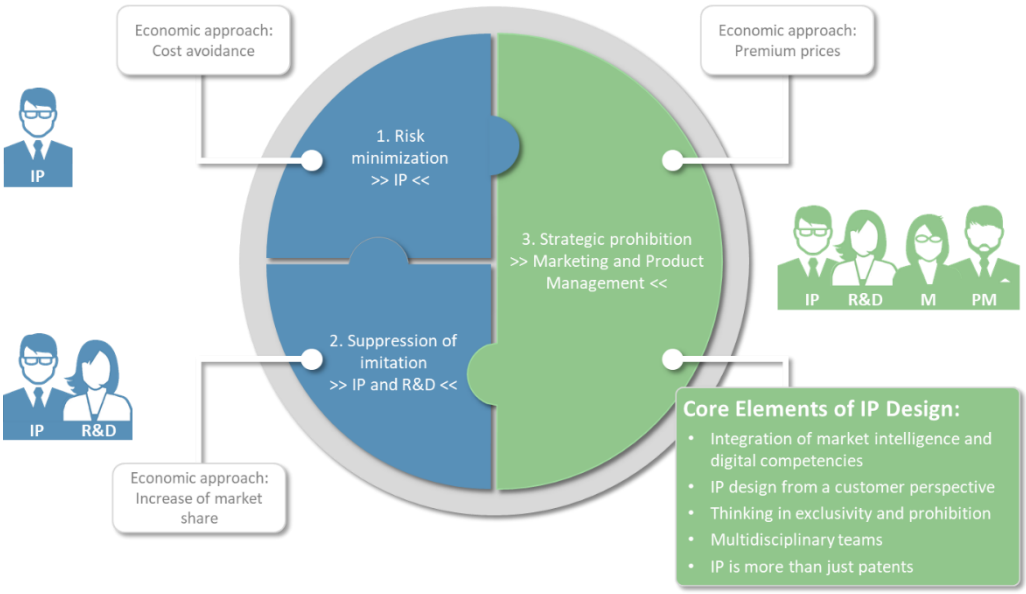


Figure 24: The integration of the marketing team into the product development and IP processes. Adapted from: *Alexander J. Wurzer, Theo Grünewald, Wolfgang Berres, Die 360° IP-Strategie – So sichern Sie Ihren Innovationserfolg langfristig, Vahlen (2016)*

Launch and Post launch review

The marketing plan is the last document that is needed before the final gate. When it is ready, the project is assessed by the decision-makers based on the final product and marketing plan. If the decision-makers are convinced of the success of the product, the product will be fully rolled out in the market. The product is launched to the market and starts its product life cycle (see "product life cycle and marketing mix" -> Integrate IP and innovation management: Part 3 Chapter 2).

After the launch of the product or service to the market it is advisable to draft a post launch or post implementation review. The purpose of the post launch review is to analyze the quality of the project implementation and to look if the expected revenue could be reached. Here, all team members should come together and analyze what went well and what went bad during the product development process. Of course, it is important, that nobody blames problems in the project on others, but everyone learns how to do better in the next project.

Reasons why to implement a post launch review include, that a post implementation review can improve the scoping process of the next project by a comparison between the final and initial deliverable. Also, the performance of the project management and the project team can be analyzed to improve it. Important learnings can be topics, which should be included into training sessions for the team to improve their performance. Additionally, the budgeting is also an important topic, which has to be reviewed, especially when it was much higher than initially expected. The most important things to be reviewed in a post implementation review are:

- A comparison of initial and final deliverables: This is also called a gap analysis. Every project has objectives and deliverable and in successful projects they should be reached and delivered. If there were gaps, the reasons for them should be identified now.
- Goals: Here, the question is, if the projects goals were reached. If they were not reached, to which degree were they not reached and what were the reasons? E.g. was the team not trained enough and how to do better next time?
- Stakeholder: Here, the stakeholders analyze the performance of the project and the team. How can the work in the team be improved the next time?
- Costs and benefits: The costs and benefits of the project should be assessed against the planned costs and benefit and when there is a discrepancy it should be analyzed to adjust future projects.

An important question in conducting post implementation reviews is also the time, when to conduct them. At times close to the launch the memory about the project is better, but also information about the market success or failure of the product or service is not yet available. Therefore, also multiple reviews at different times can be conducted.

A first review should be conducted fast after the product launch. At a later time, the team might become biased by the success or failure of the product and see the project in a

different light. Here, all information which is still in the memory should be written down. The main focus of this review is to capture the information about the practical execution of the project, e.g. were all milestones reached in time and in budget, which can be used for improvements of budgeting and planning of later projects.

A second review should be conducted some time after the launch, when first sales figures are available, and the effect of the marketing strategy can be assessed. Based on this information the initial marketing strategy can be assessed and improved not only for later projects but also for the marketing of the launched product.

Finally, a third review should be conducted to analyze the long-term product performance. This should be done, when the real results of the project can be compared with the expected results. This way the reasons behind gaps can be identified and future projects can be improved with this knowledge.

Chapter 6 | Integration of IP

Integration of IP into the innovation process

The core process of innovation management starts with the description of the customer benefits and ends with the fulfillment of the customer needs. This means that all process elements that form an interface to the IP strategy development process are already included in the innovation process. The task of the process integration of IP is now to link these elements with the related IP strategy support processes in order to increase the quality of the innovation process. Figure 25 illustrates this connection between the innovation process and the elements of the definition of IP needs and the fulfilling of the IP needs.

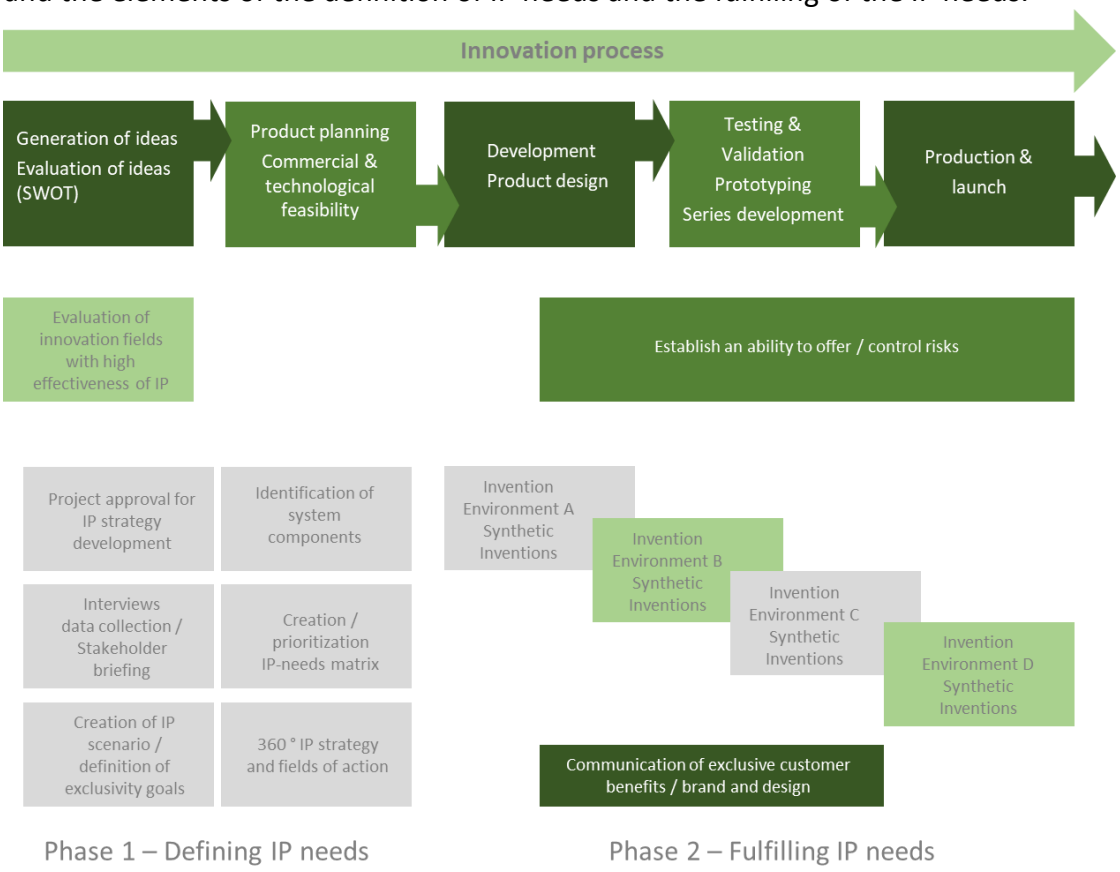
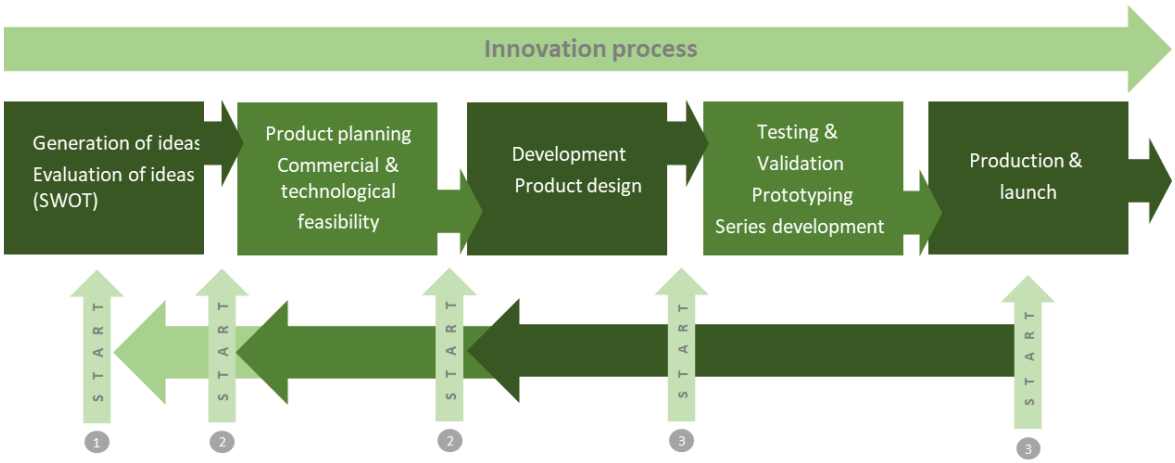


Figure 25: Defining the IP needs and fulfilling the IP needs in the innovation process. Adapted from: *Alexander J. Wurzer, Theo Grünewald, Wolfgang Berres, Die 360° IP-Strategie – So sichern Sie Ihren Innovationserfolg langfristig, Vahlen (2016)*

Here, IP management has a special task in the ideation stage. As part of the SWOT analysis (see "SWOT analysis" -> IP strategy development: Part 7 Chapter 2) that is typically carried out to identify potentially promising ideas, IP management supports the assessment of the attractiveness of market segments, possible technologies for realizing customer benefits and the activities of competitors. This additional information helps the decision-makers to make better decisions about the implementation of the ideas within the framework of the stage-gate model. In every phase of the innovation process, the company functions relevant to this

phase are involved. The IP department or the IP manager should provide information on the IP situation accordingly. This can be patent based technology and competition analyses, which supplement the marketing analyses and provide the basis for an evaluation of business and product ideas. This avoids internal disruptions that arise in the innovation process at the organizational level due to a highly functional structure. The IP department can counter the problem of the operational island through an active service orientation. However, the aim should be that the impetus for using these services, for example conducting research, does not come from the IP department, but from marketing or product management. It is an IP management task that must be assigned to these departments who also must take the responsibility.

The inclusion of IP information in the decision-making of the idea creation phase and the associated decision to carry out an IP strategy development project in parallel with product development provides decisive advantages in the market positioning. Depending on the point in time at which the strategy development was initiated, there are different degrees of freedom for securing the market position, which are compared in Figure 26.



Earlier is better! - Proactive IP strategy development secures the market position

The right time to initiate an IP strategy process is fundamentally dependent on the importance of IP for the business or product strategy and the IP-relevant information that can be derived from the market environment at the time.

The point in time determines the degree of freedom with which the company can use IP as a competitive instrument:

1. Evaluation of fields of innovation - Development of umbrella IP for the exclusion of fields of technology
2. Determination of individual exclusivity goals for the business model or the innovation
3. Prioritization of customer benefits and system components for given exclusivity goals

Figure 26: Role of IP in its implementation at the different stages of the stage gate process. Adapted from: *Alexander J. Wurzer, Theo Grünewald, Wolfgang Berres, Die 360° IP-Strategie – So sichern Sie Ihren Innovationserfolg langfristig, Vahlen (2016)*

In contrast to the classic IP generation, which only begins in the development phase and becomes active as a process when new technologies in the sense of technical inventions are developed, it is the task of modern IP management to be active at an early stage of the idea

generation process. Here, the job is to filter out topics that are relevant for the company in specific technology fields, which are suitable for the design of very general prohibition rights. With the decision to implement certain innovations and the approval of the product planning, the strategic considerations are aligned with the specifications of the business model and the research is specifically tailored to the user-relevant technology fields and competitive activities. The development of certain IP strategy projects, which only begin at the end of the development phase or even shortly before the market launch, is particularly geared towards the design of IP with a given exclusivity.

Evaluation of the economic use of IP for a company

The checklist for evaluating the economic benefits of IP examines the extent to which the company could profit economically from using IP and whether it has the necessary expertise. This statement is helpful for defining the target position, i.e. the desired level of IP maturity of the organization.

The aim of this self-test is to better assess the benefits that IP can create in the business model and the resulting need for IP. In addition, the self-test provides information on whether the company has the skills to use modern approaches to IP management and it addresses typical questions that arise in relation to the contemporary orientation of IP management. This results in two key questions for the company that the test should answer in order to provide the specifications for the corresponding project activities:

- What IP needs does the company have? Success factors for innovation lie in the details of the business model. Therefore, not only the protection of individual inventions but also the protection of entire business models against imitation is a central task. However, modern IP strategies are no longer based solely on the hope of suppressing imitations of the own technical solutions - they rather pursue the goal of creating a unique position for the own offer in precisely those aspects that are important from the customer's point of view. If this exclusive positioning meets the customers' willingness to pay, the return on innovation performance can be significantly improved.
- What capabilities does the company have to meet these IP needs? The development and implementation of an effective IP strategy requires the systematic cooperation of all corporate functions that are responsible for the successful implementation of the business model. Product management and marketing in particular know what the benefit for the customer is, how an exclusive offer is perceived and with which competitors the customer compares the company. The customer benefit aspects identified in this way must then be analyzed and traced back to technical features. This forms the basis for actively shaping valuable prohibition rights - regardless of whether an invention disclosure has been made.

Practically, the test is split into two sections containing 5 questions each regarding these two points. The answers for each question should be given on a scale between 1-10, where 1 means not important/not true for the company and 10 means very important/true for the

company. Finally, the results should be marked in the two-dimensional result matrix (see Figure 27).

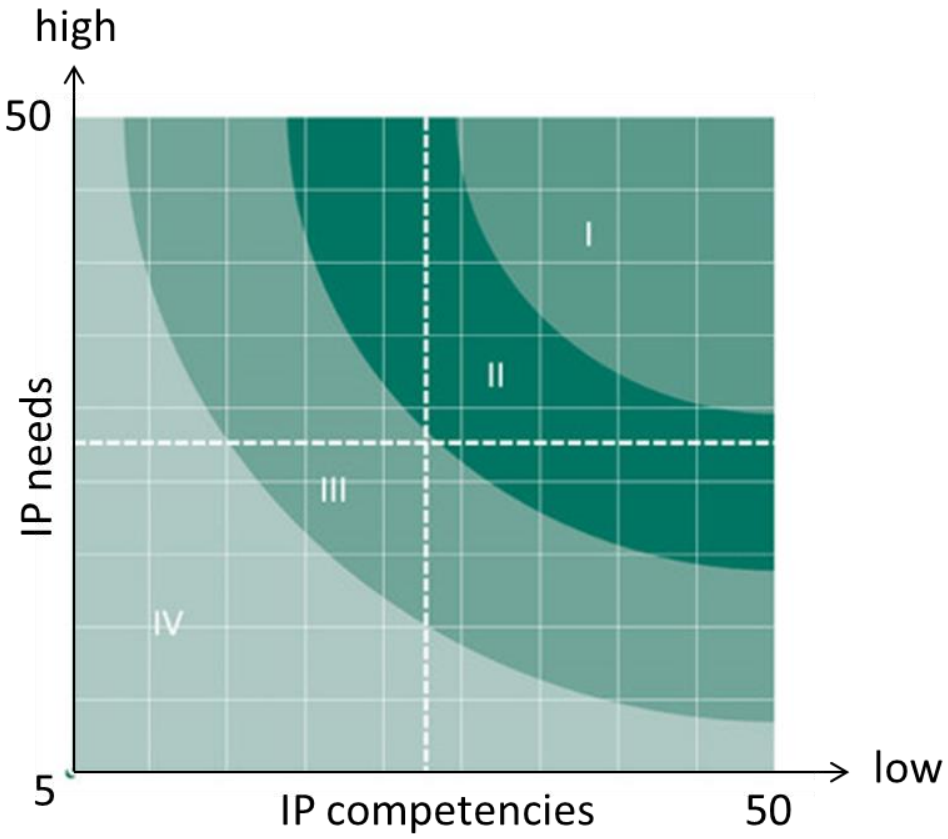


Figure 27: Result matrix for the self-assessment. Adapted from: *Alexander J. Wurzer, Theo Grünewald, Wolfgang Berres, Die 360° IP-Strategie – So sichern Sie Ihren Innovationserfolg langfristig, Vahlen (2016)*

Questions about the IP needs in the company

- How important is securing innovation returns for a company which uses IP? Companies that align their IP strategy with the business model can noticeably improve their profitability. By using modern prohibition strategies early and systematically, companies can also secure a time advantage over the competition.
- Can the customers in the market choose between the company's services and competitive offers? There is only one way to use IP profitably in the differentiation competition: to build up legally enforceable exclusive positions with customers. This is especially true of competition in mature technologies and markets.
- Is the success largely dependent on customer pricing? With the help of prohibition rights, marketing and product management have a legal instrument at hand to ensure exclusivity for the added value of the offer.
- Are customer benefit arguments critical in selling the products and services? Prohibition rights help to create benefits for exclusive customers and to defend the own market position. This increases the degree of freedom in the marketing mix.
- Are customer benefits and / or price arguments used in competition? The quality of the solutions is difficult to assess for customers, especially with technologically

complex products. Prohibition rights that are based on customer benefit make the argumentation towards the customer a unique selling point and legally enforceable.

Questions about the IP competencies in the company

- Does the company integrate market intelligence into the IP design process? Prohibition rights must be designed and implemented jointly according to the needs of sales, marketing, and product management.
- Does the company design prohibition rights based on the customer benefits of products and services? Customers are less interested in specific technical solutions than they are in the benefits of the service provided. Therefore, the alignment of the patent portfolio with the question of which customer benefits should be offered as exclusively as possible and which solution the company does not want to see in the offer in the competition is more productive than focusing on the technical solution.
- Is there a customer perception of the competencies and performance features of the company and can it be strengthened or controlled by IP? If the customer reputation is known and based on the specific competencies and performance characteristics of the company, it is possible to use IP to create a sphere of exclusivity around those performance characteristics that are decisive for the company's image in the customer's perception.
- Is the company able to design prohibition rights very early and very late in the innovation process? If IP is registered early on in the innovation process, extensive spheres of exclusivity can be secured, even if no R&D results are available yet. Likewise, the existing exclusivity should be checked alongside the market and, if necessary, supplemented with further prohibition rights.
- Is the company using the effect data of its IP for the continuous improvement of the IP design process? IP controlling creates transparency about whether the set goals have been achieved and enables active, benefit-oriented control and optimization of the portfolio.

Results

Based on the answers to the questions a result between 5 and 50 can be calculated for the IP needs and the IP competencies. Then the company can be located in the two-dimensional matrix according to the result. The matrix is separated into 4 different segments and depending on the segment a different action is advised. The suggested actions for the 4 segments are:

- Segment I: Prohibition rights are registered rather randomly and without specific targets. Dealing with IP is typically not anchored in the corporate culture. Possibilities and competencies must be aligned with one another. This is a corporate task. The management should establish an IP culture that is based on economic goals and is oriented consistently on the added value for the customer.
- Segment II: IP is created too little based on the customer and the market effect and too much geared towards the technical developments. The exclusivity effect of IP is

used insufficiently to shape markets and competitive structures. The unique selling proposition is not sustainably secured via IP. It is advised to improve the IP competence in the company. The integration of the IP process into the innovation processes should be strengthened.

- Segment III: IP generation and needs for IP do not fit. A common reason is the historical development of the IP department. Reassessment of the role of IP in the company and a consistent alignment with business objectives is advisable.
- Segment IV: The importance of IP in the business model and the resources and competencies available for it are balanced and optimize the value creation through IP. Nevertheless, the benefits and IP costs should be continuously monitored.