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# Leadership and Effectiveness of Incubation of Start-Ups: Research Scheme for Next Generation Stage Gate

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***Abstract:***

***Purpose:*** *The aim of the article is to develop and propose a modernised Agile Development tool of the Stage Gate Model, i.e., the NaxGen Stage Gate System model, for use in start-up projects. The aim of the article is also to show how start-up activities should be modified at all stages of the process and what role system gates could play in order to incubate start-ups more effectively, but above all, so that start-ups can achieve benefits of using Stage Gate.*
***Design/Methodology/Approach:*** *A review of the literature on the subject, both local and international, made it possible to identify the causes of failure of start-ups on the market. The research results were analysed using the methods of descriptive statistics. The methodology proposed by the authors was developed on the basis of a 3-year research project monitoring the activities of start-ups located on Start-up Platforms in Poland.*
***Findings:*** *The key reasons for the failure of start-ups concern marketing aspects and leadership, for example, misidentification of consumer needs, poor pricing policy, inappropriate product features, or the fact that the product is unintuitive and difficult to use, poor promotion. These conclusions are very surprising as the knowledge and information on marketing have been accessible for decades. There is currently no work methodology dedicated to start-ups from the idea to commercialisation.*
***Practical Implications:*** *The proposed solution has significant practical implications. The NexGen Stage Gate system is a universal model. Due to the inclusion of Agile methodologies, Scrum, it has become even more useful for working on start-up projects. The authors' scheme of research methods contributes to eliminating the biggest problems of start-ups, as well as to reducing the risk of investors investing in start-ups.*
***Originality/value:*** *The measure of the originality of the proposed solution is the Model Stage Gate System for start-up incubation. As part of the adopted methodology, lists of studies, analyses and suggestions were developed that should be implemented at individual stages and precisely verified by Gatekeepers.*

***Keywords:*** *Stage Gate System, Management of technological innovation, start-ups.*
***JEL classification:*** *O3, O31, O32, M12, M31.*
***Paper Type:*** *Research study.*

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## 1. Introduction and Stage-Gate® Evolution Overview

At the end of the 1980s Cooper (1990) presented the concept of the process of implementing product innovations under the name Stage-Gate® process. The main goal and assumption of the method was to structure the process of new product development (NPD). Research conducted in many innovative companies has shown that successful management of the New Product Development (NPD) process helps companies implement innovations faster and more effectively. The most basic form of Stage-Gate® was introduced by Cooper in 2008.

The necessity to structure NPD processes in companies resulted from the efforts of corporate management to increase the success rate of implementing innovations on the market and to minimise product development time (Cooper and Kleinschmidt, 1995). Unfortunately, implementing innovations is not only the choice of companies that want to stay ahead of their competition and become market leaders, it is sometimes a necessity, for example, when new products have to replace expiring patents. In the 21st century, most companies know that the continued development of new products is a key success factor in ensuring the company's sustained performance (Blundell *et al.*, 1999). While, on the one hand, companies noticed the benefits of implementing innovations, on the other hand, this process was associated with a high risk of losses (Cooper et al. 2004). The study compared companies that were successful in the new NPD, which were among the top 20% of the market, and companies that were unable to cope with the NPD process, ranked in the weakest 20%. In addition to the lower success rate, the weaker 20% of companies show more than 3.5 times the failure rate than the top 20%.

Moreover, the top 20% of outputs directly correspond to the percentage of NAP projects that are timely and delivered within budget. It was an indisputable and final proof that systematising and structuring the process of implementing innovations is crucial for the success of innovations on the market. Much research at the time highlighted failures in this area (Crawford, 1987). The high failure rate was described figuratively by Cooper (2001), "Fighters have their generals – senior management that plans and sets direction and tries to define a business and technology strategy for its army. Generals speak in terms of strategic strokes, strategic battlefields, and the need for strategic alignment. Unfortunately, many generals do not understand the art of creating new products or technology strategies very well. So, as is often the case with a poorly chosen strategy, the battle is won or lost tactically in the trenches by assault troops and infantry."

The most important weapons are speed, strategy and tactics in NPD processes due to declining product life cycles and increasing competition (Cooper, 1990). The speed of market launch provides a competitive advantage by recognising customer demand faster than the competition, it also ensures higher profitability through earlier revenue realisation and minimises surprises while avoiding the threat of a rapidly changing market environment (Cooper, 2001). The strategy focuses on determining

the strategic direction of the NPD process, products and technologies worth investing in. On the other hand, tactics describes a set of manoeuvres aimed at bringing a new product from the idea stage to the market launch (Cooper, 2001). In short, only some companies seem to know how to effectively and regularly adapt the NPD process to outperform their competitors in the long term. These failures were empirically attributed to disorder, poor organisation, inadequate quality, and schedule overrun (Cooper, 2008).

Stage-Gate is based on the belief that product innovation is a value creation process that starts with ideas and ends when a product or service is successfully launched. Stage-Gate integrates pre-development activities (business case and initial opportunity), development activities (technical, marketing and operational development) and commercialisation activities (go-to-market and post-launch learning) into a single process. The process integrates all key stakeholders in the role of responsibility for added value. Stage-Gate Discovery-to-Launch is designed to improve the speed and quality of execution of new product innovation activities. This process helps project teams focus on the right activities and information, with the right level of detail, to support the best possible decision and allocate the appropriate capital and operational resources. This process empowers the project team by providing them with a roadmap with clear decisions, priorities and outcomes for each gateway. Higher quality of products delivered to the gates enables better and timely investment decisions.

This process allows for the coordination of all areas responsible for the implementation of innovations and measures taken, while ensuring transparency and supervision over the innovation process. Thus, it enables the company's management to strategically manage innovation. The Stage-Gate process structures the complex and chaotic process of moving an idea from discovery to launch and breaks it down into smaller stages (where design activities are carried out) and gates (where assessments and business decisions are made). Each stage is aimed at getting to know and gathering specific information in order to move the project to the next stage or decision point. Each stage is defined by a goal and the activities carried out in it. A typical Stage-Gate model has 5 steps:

- Stage 0 – Activities aimed at identifying new business opportunities and generating new ideas for products, services and technologies.
- Stage 1 – Initial research and scoping of the idea – mainly secondary research – to better define the concept, assess technical feasibility and gain insight into commercial prospects.
- Stage 2 – Business Case. Detailed research, both market and technical. These are fundamental research and experiments leading to a business case, including product / service and design definition, design justification, and proposed development plan.

- Stage 3 – Development of a detailed design for the development of a new product or service and design of the manufacturing process required for final full-scale production (testing of the Alpha prototype).
- Stage 4 – Testing and verification. Market, laboratory and plant testing or trial to verify and validate the proposed new product, brand / marketing plan and production (Beta prototype testing).
- Stage 5 – Start-up and commercialisation. Start of full-scale production, marketing and sales.

Benefits of using Stage-Gate Discovery-to-Launch:

- Greater success on the market (sales of new products and profit growth).
- Faster and greater return on investment.
- Greater success of projects implemented in the company (speed, scope, prioritisation and budget).
- Greater portfolio transparency for better management efficiency.
- Improved team collaboration within the company.
- Better cooperation with external partners.

Stage Gate minimises the risk of missed innovations. Looking at the stages, you can see that the cost of each stage gradually increases and therefore requires more investment and therefore generates a greater loss in the event of failure. It will not happen if the process gates are checked. It is the process gates that are the key element in minimising risk. If we control the entire process well and the list of control questions at the gates is properly selected and insightful, then each subsequent stage gradually reduces the uncertainty and risk.

Before the product enters the next stage – that is, it passes through the respective gate, where a team of experienced business and technology experts (gatekeepers) decide whether to continue investing in the project. The gate is a checkpoint at which the project leader must present a synthesis of what was done and learned in the previous stage to the inspection team (gatekeepers). Each gateway is structured in a similar way, quality assurance, business case, plan and resource approval to accelerate the next step. Gatekeepers measure outcomes against a defined set of success criteria.

Traditionally, the Stage-Gate process includes 6 proven criteria: strategic fit, product and competitive advantage, market attractiveness, technical feasibility, synergies / key competences, reward / financial risk. The traditional process also envisages 3 types of decisions: Go, Resignation - Kill, Hold, Deferment - Hold / Recycle. R. Cooper introduced the concept of Stage-Gate® processes that formed the basis of most current industrial NPD processes (Acur *et al.,* 2012; Lewis, 2001). In the 1990s and early 21$^{st}$ century, Stage-Gate® Discovery-to-Launch was the standard methodology for designing new, innovative products in many large companies

around the world. Unfortunately, times are changing. The environmental is growing more turbulent, product life cycles are shortening, and consumers' expectations of products are constantly increasing. The classic Stage Gate process, which is linear in nature, has over time come to be considered by some companies to be too rigid and inconsistent with their innovation implementation processes. In particular, the linearity and excessive rigidity of the process was stressed. It was believed that new generation processes should be more agile, flexible, dynamic, accelerated, and at the same time slimmer, faster, more adaptive and risk-oriented (Cooper, 2014). This criticism was captured and implemented in the next generation of Stage-Gate® systems.

The next-generation system called the Triple A system is adaptive and flexible, agile and accelerated. These features are achieved especially with four attributes: spiral development cycles, contextual definitions of steps and activities, risk-based contingency models that guide the decision-making process, and flexible Go / Kill decision criteria. At first glance, the practices and recommendations of companies creating new systems from idea to launch are very similar to a traditional process, there are still stages where work is done, and there are still gates at which decisions are made. However, the details of this process and its functions are completely different: a more agile, dynamic and flexible picking process emerges that is leaner, faster, more adaptive and risk-based. The next-generation Idea-to-Launch system is characterised by the following features (Table 1).

***Table 1.*** *Idea-to-Launch System Features*

| Feature | Meaning of the feature | Reason for implementation |
|---|---|---|
| Adaptable | Includes spiral or iterative development to get something early and often through a series of iterations of building, testing, and improving in contact with customers. | At the beginning of the process, the product may be less than 50% defined as it enters the development phase, but it evolves to adapt to new information as it goes through development and testing. |
| Flexible | The activities at each stage and the products delivered to each gate are unique to each innovation project, based on the market context and the needs of the development process. This is in contrast to the SOP (Standard Operating Procedure) approach to product development, which defines standard activities and products. Activities and results were determined on the basis of an assessment of project assumptions and risks. Finally, the Go / Kill criteria are flexible - there are no standard or universal kits for each gate. | Innovative products are currently very diverse and require a different approach on each scene and at each gate. Standard procedures can only be reduced to 20-30%. The rest of the procedures are unique. |
| Agile | The next-generation system incorporates Agile Development, a rapid product development system developed by the software industry. These are sprints and | The speed with which new and improved products are now brought to market must not be limited by standard process |

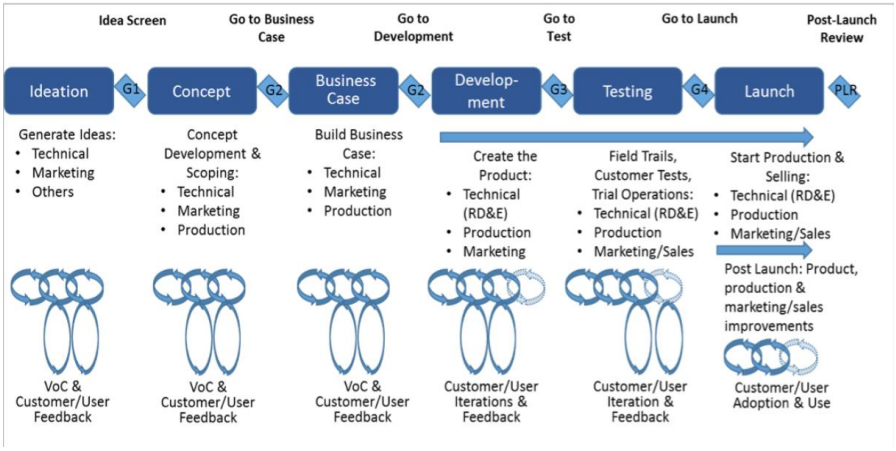
| | | |
|---|---|---|
| | scrums - short, time-limited increments with the product defined as something that can be demonstrated to stakeholders (rather than documented). These new systems also emphasise a fast and agile transition from a milestone to a milestone and are based on a much more simplified system. | procedures. Controls and gates are still important, but they must not delay the process. Avoid unnecessary documentation of the entire process and bureaucracy. |
| Accelerated | The next generation idea-to-launch system focuses on accelerating the development process. Projects in the system have adequate resources, especially large projects, and are fully staffed by a dedicated, multi-functional team to ensure maximum speed to market. The activities within the stages overlap and even the stages overlap; the concept of "stage" is less relevant in this new system. Robust IT support is provided that reduces work, ensures better communication and speeds up the process. | In the new, highly competitive market, battles and wars for customers will be won by those who act not only methodically but also quickly. The NPD process must be accelerated. The world is moving too fast today to allow for a rigid product definition. |

***Source:*** *Original development based on Smolnik and Bergmann (2020). Structuring and managing the new product development process - review on the evolution of the Stage-Gate Journal of Business Chemistry (1) 41.*

The traditional Stage-Gate process requires the product and design to be defined before the design enters the development phase. Indeed, "sharp, early and fact-based product definition" is a core principle of Stage-Gate (Cooper 2011; 2013a). But sometimes requirements just change with time that passes between the beginning and the end of development - a new customer need, a new competing product or a new technological opportunity arises and the original product definition becomes invalid. In this way, smart companies, especially those that carry out more risky and bolder projects, have created a system from idea to launch that is much more adaptive. Products may be less than 50% defined at development start, but data are collected during development; product design and definition adapt to new information, customer feedback and changing conditions along the way to market. Although the framework of scenes and gates and the idea itself remain the same as in the standard version of Cooper's model, the implementation of individual processes is different (Cooper, 2014; Ettlie and Elsenbach, 2007) (Figure 1).

Agile development methods were created primarily for software projects. However, in recent years, agile methods have also been integrated with traditional stage gating methods, resulting in an Agile – Stage-Gate® hybrid process in 2016 (Conforto and Amaral, 2016; Cooper and Sommer, 2016). These methods are based on Agile Manifs – created by IT industry leaders in 2001, and contain a set of rules for efficiently developing new software code (Beck *et al.,* 2001; Highsmith *et al.,* 2001). After the first trials and implementation of hybrid processes in the manufacturing industry, several studies brought positive results (Cooper, 2014; Cooper and Sommer, 2016; Sommer *et al.,* 2014). The effects cover a wide range of benefits, which are:

***Figure 1.*** *The framework of scenes and gates*




***Source:*** *R.G. Cooper, S. Kielgast, T. Vedsmand (2016), Integrating Agile with Stage-Gate® – How New Agile-Scrum Methods Lead to Faster and Better Innovation, https://innovationmanagement.se/2016/08/09/integrating-agile-with-stage-gate/*

- Better concentration and prioritisation.
- Increased team morale.
- Better process and method matching.
- Increased productivity.
- Improved communication and coordination.
- Faster response to change (Cooper, 2017a; Cooper and Sommer, 2016).

In addition, the benefits of Agile hybrid processes - Stage-Gate® include (Conforto and Amaral, 2016; Cooper and Sommer, 2016), advanced customer focus, VoC integration, avoiding resource allocation problems and shortening the development cycle time. The Agile Scrum Manifesto method represents the most popular version of the Agile principle and is most often chosen for integration with Stage-Gate® processes (Cooper and Sommer, 2016; Sommer *et al.*, 2014). Therefore, the Agile-Stage-Gate® hybrid process includes Scrum sprints (Smolnik and Bergmann, 2020).

Planning for a sprint section involves a sprint plan that includes all the activities that are necessary to achieve pre-defined goals (Cooper, 2017a). Scrums are performed daily for the team to review what has been achieved and what new problems and challenges have emerged. The overarching goal of each sprint section is to provide an improved prototype or protocols that can be tested by customers (Cooper, 2017a). The finished prototype does not have to be a physical product, it may be a finished design drawing, computer simulation, or even a rework of VoC results (Cooper, 2017a).

Based on feedback, the design team decides which improvements should be made in the next iteration step (Abrahamsson *et al.*, 2002). Agile - Stage-Gate® hybrid

processes become particularly important in the development and testing stages of new physical products, as customer feedback shows the greatest impact on these stages of development (Conforto and Amaral, 2016; Cooper, 2017a).

## 2. The Causes of Start-up Failures

In times of dynamic development of entrepreneurship and opportunities for the development of innovation, also among micro and small companies a question arises similar to the one asked by Cooper's team in 2004 - what distinguishes winning companies from losers? Why do some of them successfully enter the market and others often end their activities after 2-3 years? Do other factors affect the success or failure of microenterprises, such as the Covid 19 pandemic (Urbańska, Parkitna, and Kubicka 2021). Many years of practical experience, research projects implemented for technology parks, technology transfer centres, as well as independently carried out and commissioned research allow us to conclude that the reasons are similar to those that were noticed in the 90s in large companies implementing innovations. As in large companies, in NPD processes, start-ups have a problem with a high risk of failure.

The key problems are lack of competence (Kupczyk, 2011; 2014; 2021; Sylwestrzak and Sus, 2021), lack of concentration, lack of customer orientation and lack of structuring of the entire process. Structuring the entire incubation process is very important for micro and small companies, probably more meaningful than for larger companies that may have had less structured processes but still operated within an organisation and specific procedures. Unlike large companies, start-ups often do not have any organisation or operating procedures. These are usually teams of creators / originators who have very little business experience. Many things are contractual and ad hoc.

Nevertheless, these companies have a significant share in the development of innovation in individual countries. European Union countries devote public money to supporting innovation and entrepreneurship processes, including in particular the incubation and acceleration of start-ups. Therefore, minimising the risk of failure is important not only for start-ups, but also for individual countries that spend public money, and for private investors, for example Ventures Capital funds, Business Angels, etc.

For the purpose of this article, research into the causes of start-up failures is analysed. At the same time, the results of the first round of research on start-ups located on start-up platforms in Poland were used. Six (6) start-up platforms in Poland incubate between several dozen and several hundred start-ups annually. Research of this group is planned for over 3 years and will be carried in lots of 6 months. This means 6 studies monitoring the progress of start-ups over 3 years. Start-ups and incubation managers were offered to implement a modified Stage Gate

process. Research on progress in this area will therefore test the methodology developed on the basis of Agile-Stage-Gate.

According to research conducted around the world (CBInsights 2019, N = 101), the key reasons for the collapse of start-ups include:

1. no market need;
2. lack of money;
3. inadequate team;
4. whether to take part in the competition – competitors;
5. price list / price calculation;
6. a product without a business model;
7. poor marketing;
8. ignoring clients;
9. missed timing of the product;
10. loss of concentration.

Solutions to problems that are interesting to solve, rather than those that serve the needs of the market, were cited as reason number 1 for failure, reported in 42% of the cases. In the case of start-up ideas, there is often a risk of indicating a hypothetical market need or a hypothetical market segment. The initiators believe that such a need exists without conducting thorough research in this area. Even the results of research which are actually unfavourable for start-up are often interpreted optimistically. There is a lack of strategic reflection and a critical view of the product or service. Just because a problem exists doesn't mean people will pay to solve it. Problems often articulated by buyers are just their imaginary wishes. When a solution appears, they don't want to use it at all. It is surprising that at a time when so much is known about marketing, companies have such a basic problem in identifying the needs of buyers.

The second reason why start-ups fell, indicated by 29% of start-ups, was exhaustion of financial resources. On the one hand, start-ups at the beginning of their journey struggle with the lack of financial resources for the development and implementation of their idea, on the other hand, when they obtain financing, they do not manage it properly. This means that they do not assign the money where it is actually needed. Very often financial resources are spent on product development, and too little or not at all on market research and analysis. Money and time are finite and must be allocated wisely. The question of how to spend your money is a common problem for start-ups.

An improperly selected team, and in particular lack of a person with business knowledge and skills, is the third cause of decline indicated by 23% of start-ups. Teams that work on innovation are usually formed by people with similar qualifications who know each other and who are fascinated by solving a technological problem. Very often, these teams lack specialists in the field of

business, including marketing, finance and management. At first, this problem is not noticed, and then there is a tendency to purchase the services of such people on the market. Advisory services are expensive. A completely different category of problems is the lack of communication and proper understanding between technical and business staff.

A serious problem with the incubation and success of start-ups involves the proper identification of competition. In the CBInsight survey, 19% of companies indicated misidentification of competition as the cause of their failure. It's not healthy to be obsessed with competition, but ignoring competition is a recipe for failure. Start-ups often treat their products and services as innovative and assume that there is no competition for them. According to the science and art of management, they should consider competition on many levels: at the brand level, at the level of product functionality, but they should also identify substitutes. Another marketing problem that is the fifth most important reason for the decline of start-ups is the appropriate pricing policy. How to set a price for something that is innovative and so important for originators? This is another very important area of research.

In line with the marketing mix concept by Ph. Kotler, all instruments must "play together to be successful. It is a typical practice of start-ups to set overly optimistic, high prices when creating business plans, and to use a cost-based pricing method. Prices of innovative products are usually poorly calculated. They are often too high for customers. The product is then not worth its price and is not purchased. There are also situations when prices are too low. Buyers then do not trust the product or the value it product promises due to the low price.

Lack of thorough market tests and listening to consumers can be seen in the next causes of failures – the product is not very friendly (not intuitive) for customers. The research presented by CBInsight (2019) shows how many reasons for the collapse of start-ups result from the aspects of the lack of market testing of the product, business model, pricing policy or promotion at individual stages of incubation. Other studies confirm this. In the article "5 Most Common Reasons Why Startups Fail", it is estimated that approximately 90% of start-ups fail in the first three years. The vast majority of the same reasons. The reasons include:

1. Market problems.
2. Bad business model.
3. Lack of money.
4. The product does not meet the market needs.
5. Badly matched team.

The analysis of the results of research carried out in different countries leads to surprisingly similar conclusions. Each start-up is different, each must find its own path to success, but at the same time each of them is subject to the same market mechanisms. According to the "Startup Genome Report Extra on Premature Scaling"

prepared by researchers from Stanford and Berkeley Universities, up to 92% of start-ups fail in the first three years of operation (based on data from 3,200+ technology start-ups). The following 12 reasons for start-ups' failure are listed in the study:

1. Not solving a real market problem.
2. Lack of money.
3. Incorrectly selected team.
4. Competition.
5. Inappropriate price.
6. Unfriendly product and ignoring recipients.
7. No business model.
8. Poor marketing and sales.
9. Ignoring customer needs.
10. Inappropriate time for a product or service.
11. Loss of concentration and lack of persistence.
12. Failure to match founders or investors.

In the next stage of the research process, start-ups' needs were studied. The study was limited to the region of the Dolnośląskie Voivodeship (September, 2018). Thirty start-ups participated in the study, and their representatives answered the survey questions by phone (CATI) and using the online form (CAWI). In the context of researchers' interest, one of the key research problems was the question of the importance of marketing or market research when introducing new products or services to the market. The study asked for assessment in which of the listed industries access to marketing or market analysis equipment and the ability to use it were important in introduction of new products or services to the market.

While conducting the survey, it was noticeable that many respondents found it difficult to comment on research needs in the industry in which they operated. The experience of researchers shows that decision makers have problems identifying information needs related to making business decisions. This applies not only to start-ups. An important problem is the lack of awareness of the market research directions that can and should be commissioned at various stages of start-up incubation, but also at individual stages of innovation implementation.

***Table 1.*** *Assessment on a scale of 1 to 5 of the significance of marketing or market research for selected industries when introducing new products or services to the market.*

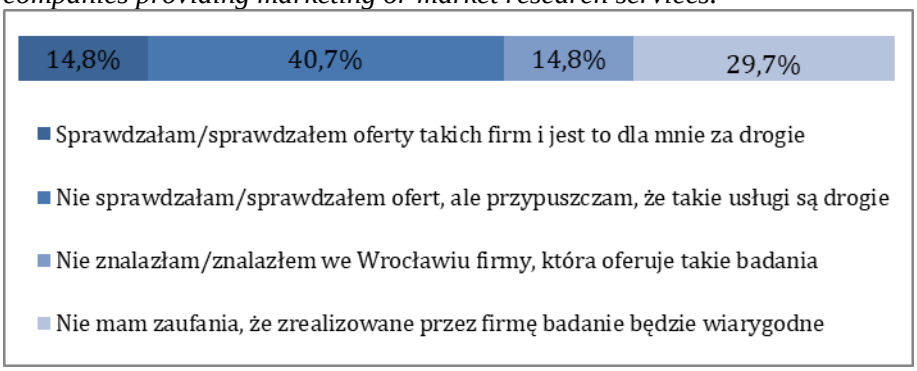
| Industry | Average | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| Chemical and pharmaceutical industry | 3,7 | 10.0% | 10.0% | 20.0% | 16.7% | 43.3% |
| Information and communication technology (ICT) | 3,9 | 6.7% | 10.0% | 13.3% | 23.3% | 46.7% |
| Spatial mobility | 3,5 | 6.7% | 6.7% | 33.2% | 26.7% | 26.7% |
| High-quality food | 3,9 | 3.3% | 3.3% | 33.3% | 23.3% | 16.8% |

| | | | | | | |
|---|---|---|---|---|---|---|
| Natural and recycled materials | 3,3 | 10.0% | 10.0% | 43.3% | 10.0% | 26.7% |
| Production of machines and devices, material processing | 3,7 | 3.3% | 13.3% | 26.7% | 26.7% | 30.0% |

***Source:*** *Original study based on the CAWI and CATI survey, 2018.*

A large percentage of respondents (46.7%) believed that in the field of information and communication technology (ICT) and in the chemical and pharmaceutical industries (43.3%), marketing or market research was very important (5). The same applies to the high-quality food industry, where only two ratings were below 3. When asked "whether your company currently uses the services of companies providing marketing and market research services", majority of respondents (90.0%) replied that they did not currently use this type of services, and the rest said that they did so sporadically. Figure 2 shows the reasons for not using these services.

***Figure 2.*** *The reasons why the surveyed enterprises did not use the support of companies providing marketing or market research services.*




***Source:*** *Original study based on the CAWI and CATI survey.*

The most frequently chosen answer (40.7% of respondents) suggests that companies do not look for offers from companies that provide marketing or market research services because they consider them too expensive. During CATI surveys, several respondents indicated that they did not need it or that the analysis they carried out on their own was enough. More than half of the respondents (56.7%) did not know any companies providing this type of services, almost every third person knew little about their offers, and only 13.3% knew many such companies.

In telephone interviews, several of the companies indicated that marketing or market research when introducing new products / services to the market was not needed in running a business in the industry that the given company represented. Other economic entities confirmed that such an analysis was important, but most often they carried it out on their own, very often due to the high costs associated with it.

In total, among all the respondents, 27 companies did not use the services of enterprises offering marketing or market research, and three only sporadically. The surveyed companies believed that the concept of business incubators and technology parks was very good, because these institutions helped very young companies start a business, which cannot afford to cover the high operating costs at the beginning. In their opinion, a great advantage is the preparation of a ready place to work, i.e., providing basic office infrastructure. It is also said to be the right place to network with other companies and verify your own business ideas. The prices of services provided in such places are important for young entrepreneurs.

## 3. Justification for the Choice of the Stage Gate Methodology in the Startup Incubation Process

In the context of the conducted research, it is crucial to propose a methodology for managing a start-up incubation project that would respond to all identified weaknesses in the thinking and action of the originators and founders. The following aspects were considered key:

Focus on the business justification of the start-up's project:

1. Process control from idea to commercialisation
◦ Gateway (control, control questions, validation of assumptions)
◦ Control team: mentors, Supervisory Board.

2. Close connection of the incubation phases with "marketing thinking":
◦ customer-cantered process,
◦ marketing strategy,
◦ detailed marketing plans,

3. Possibility of refining assumptions (technical, marketing, financial) after research carried out in each phase of the process.

4. Cost control:
◦ costs vs potential income.
◦ project costs vs risks.

Absolutely, the incubation methodology should be the Customer-driven projects methodology.

## 4. Original Design of Research Methods for Individual Stages of Incubation Based on the Next Generation Stage Gate System

Phase 0 of the incubation process is generating the idea. In the case of incubation of start-ups, this phase concerns generating an idea not only for a product or service, but more broadly, for the company's operations. At this stage, it is recommended to

focus on what is to be the value that a given start-up will offer on the market. Phase 0, which is an invention or idea, is the stage at which companies often take part in idea generating activities, such as brainstorming or other group thinking exercises. Once the idea generating team comes up with a product, service or business idea, it must be delivered to the first gateway and thus checked by the organisation's decision makers. When looking for ideas for new products, the organisation should look to the outside world to suggest business opportunities.

Using methods such as those used in empathetic design can be very helpful. It is also advisable to communicate with your customers to understand how and why they use the products. In particular, communicating with prime users can provide developers with great feedback as these customers are likely to be the most passionate about the industry or the concept of new products that better meet their needs. It is also valuable to establish contact with suppliers of services or production elements. Such companies also have a very good knowledge of the market, and what's more, they will help the company estimate delivery costs, deadlines, etc. All activities in phase 0 are designed to prepare material for gatekeepers for 1 control gate.

Market research and analysis methods that should be applied at the idea generation stage:

1. Voice of the Customer (VoC).
2. Customer Experience.
3. Focus Group Interview (FGI).
4. Methods and techniques of projective research.
5. Design Thinking.
6. Critical Design.
7. Brainstorming.
8. Observation.

At the Gate 1 stage, the submitted business idea should be verified for the first time. When initiating the verification, originators and investors should have information about customer experiences with similar products, customer opinions about products that can be classified as substitutes, hence the particular importance of customer research. In the field of research on innovations, customers can be involved in the process of coming up with a product concept, hence the proposed Design Thinking and / or Service Design methodology. It is very important to analyse the potential competitors, competitors' products and services and their life cycle.

At this stage, it must be assumed that competition for the product or service offered by the start-up definitely exists. If it is not direct competition, there are certainly products or services that otherwise meet the specific needs of customers. Competition should be sought intensively on an international scale, and not only at the level of a similar product, but the entire business solution. Identifying even

distant competition allows you to research the strengths and weaknesses of similar products and the behaviour of customers towards these products.

Studying the demand for an innovative business idea is complicated. Firstly, because demand research is difficult in itself. Secondly, it is difficult to ask consumers about something they do not know exactly and have no experience with. Often times, customers are confused about what they want (or need) in the first place, so it's impossible to get 100% accurate product definition before developing it. Steve Jobs, who was never a supporter of traditional market research, said: "People don't know what they want until you show it to them" (Isaacson, 2011, p. 567).

The research methodology used by the originators will be of key importance. The main tenets of this methodology should be identified when evaluating the idea. At this stage, an in-depth analysis of consumer behaviour should be performed, considering what the customers' objections to purchasing the product may be, what will be the overt and hidden attitudes of customers and their motives. It should be remembered that the existence of a need will not always result in its being met. There are needs to be met without purchasing. Customer declarations regarding the existence of a need or willingness to purchase a product do not guarantee positive effects in reality.

In the case of projects implemented as start-ups, research in Phase 0 is key to move to Phase 1 - Preliminary stage. The proposed Phase 1 research and analysis methods are:

1. Voice of the Customer (VoC).
2. Customer Experience.
3. Focus Group Interview (FGI).
4. Methods and techniques of projective research.
5. Design Thinking.
6. Individual In-depth Interview (IDI) / TDI.

The first phase of the product development process is scoping. In the case of a start-up project, at this stage the main goal is to evaluate the product and the corresponding market. Scientists need to recognise the strengths and weaknesses of the product and what it will offer a potential consumer. At this stage, an in-depth analysis of consumer behaviour is advisable, needs without purchasing, overt and hidden consumer attitudes, motives. The recommendations obtained from Gatekeepers can be tested here. In numerous interactions with customers, you should test ideas for a set of product features, formulate benefits and value of the product for the customer. According to the theory and practice of marketing, it is worth going through the entire structure of the product (Kotler, 1996), as well as its key functionalities. The prioritisation of features and functionalities sometimes allows quick choice of those aspects that are worth investing in and those which should be let go of for a while.

One must not forget to continue the analysis of competition, which may change with the evolution of the product and its functions in the design process. By determining the relative level of competition threat, the management team will be able to recognise if it should continue producing the product. At this stage, the product marketing position should be analysed, but also in the case of a start-up, it will be the positioning of the company on the market. Positioning has very large implications for the marketing strategy, especially the pricing strategy, but not only. Therefore, the positioning process should be justified by research and submitted for a decision on the gate.

Phase 2 - Create a business case and action plan. The next phase in the Nex Gen Stage System process involves creation of a business case and market action plan. From the point of view of start-ups, this is a key stage of operation, as it is the last of the conceptual phases, and therefore during this time companies must conduct a solid analysis before they start investing in the technical development of the product and building the company. This phase is generally difficult, complex, and resource-intensive. However, companies have to put a lot of effort at this stage, because it is directly related to the success of a new product and in the case of small companies such as start-ups it equals creation and development of the company. A start-up's activity is usually closely related to one first product / service / idea. When the product fails, the entire start-up fails. This phase consists of four main steps: product definition and analysis, business case building, business plan building, and feasibility review. Research and analysis methods recommended in phase 2:

1. Focus Group Interview (FGI).
2. Individual In-depth Interview (IDI) / TDI.
3. Methods and techniques of projective research.
4. Lifetime value - customer value analysis.
5. SmartLab.
6. Design Thinking.

Thorough product analysis and definition consists of a series of activities that will provide the information needed to define and justify the development of a new product. One of the first activities is researching the user's needs and willingness to buy, but this time one aimed at determining the value of the product for the customer. This includes questions about the product, such as what benefits does the product provide and what features the product should have, how much customers are willing to pay to solve their need provided for by the product. During this time, the company should conduct surveys and interviews with current and potential customers and employees. Then the company has to conduct a market analysis.

They must define the size and segmentation of the market, growth rates, customer trends and behaviour, and distribution channels for each market segment. When it comes to market segmentation, it is proposed not to focus on the analysis of one or two segments, but to show the entire map of segments, identify market niches and

analyse the attractiveness of market segments, in particular target groups. As part of the market analysis, it is necessary to analyse Porter's 5 forces, PEST, analyse macro-environment trends, etc. On this basis, it may be possible to estimate the size and potential of the market for the start-up.

After completing the market analysis, the company must conduct a competition analysis. It's important to know how your competitors perform, in addition to their strengths and weaknesses. Technical activities are carried out in parallel to the research and analytical activities. In phase 2, the company has to create a technically feasible product concept. Upon completion, the company can perform a manufacturing and operational cost analysis along with a market and commissioning cost analysis. Then the company can start testing the concept it has developed. This is when early prototypes are developed and presented to employees and consumers for feedback and customer reaction assessment. This allows the company to make the necessary changes and see the sales potential of the product.

Another key activity in this phase after the market analyses is the development of a business model (Business Model Canvas or other Pimento method). These activities will help you develop your marketing strategy. Of course, business analysis, risk analysis and financial analysis of the new product are also necessary. A business case is a document that defines a product, and in the case of start-ups, the entire business, and provides justification for its development. As part of the business case, a project plan is created that includes: a planned list of tasks and events with schedules for milestones throughout the development process; staff, time and financial resources needed to complete the project, and the expected release date of the new product.

Phase 2 is of strategic importance in the context of start-up development. Comprehensive, insightful and reliable information provided in this phase will be of interest to the gatekeepers of gate 2. Thus, the decisions made at gate 2 also gain importance. It is a good solution if the control team consists of more business, industry and technical experts in order to make the most optimal decision. If a start-up obtains a "Go" decision, it means going to phase 3 - the product development phase. It must be remembered that any decision to continue operations is very optimistic, but it is also associated with increasing responsibility. Phase 3 is already generating significant costs.

Phase 3 - Development stage. Product design and development is ongoing in the development phase, including some early simple product tests and possibly some early customer tests. The product is gaining momentum as the company engages more resources and takes full advantage of cross-functional teamwork. Marketing, technical, production and sales departments meet to present their expertise. Having a diversified and parallel development phase ensures that the product continues to meet the company's technical and financial goals. A diverse team allows the development of specific roles and leadership positions when team members

contribute by using their strongest qualities. The end result of the development phase is a prototype that will undergo extensive testing and evaluation in the next phase of the process. The proposed methods of market research and analysis in Phase 3 are early prototype tests (Alpha prototypes). At this stage, it is more important to focus on designing the product according to the numerous studies carried out within stages 0 and 1. To ensure that the new product is protected from the competition, tests of the Alpha prototype are usually carried out among internal staff, company partners and trusted customers.

The data generated in the prototype production process feed the information to business functions. Marketing plans are being clarified. At this stage, it is worth refining such aspects as: pricing policy, distribution channels, promotion channels.

Phase 4 - Test & Validation stage. This phase provides validation for the entire project. The areas that will be assessed are: the product itself, the production process, customer acceptance and financial value of the project, business model, marketing strategy, financial plans. This phase includes three types of testing: close testing, field testing, and market testing. The main purpose of Close Testing is to find any bugs or issues with the product. Testing will initially be performed by internal staff and customers and partners who are close to the company. It's important to make sure they understand how the product should perform so they know what it should and shouldn't do. R&D team members should be present to observe participants using the product and take notes or data that may be useful. Proposed methods of research and analysis in phase 4:

1. Focus Group Interview (FGI).
2. Methods and techniques of projective research.
3. Individual In-depth Interview (IDI) / TDI.
4. Observation of behaviour, methods of use.
5. Field tests: (a) the most common simulated market experiments in which customers will be exposed to new products in an advertising and purchasing situation, (b) trial sales carried out by specific channels, regions or consumer segments.

Field testing or beta testing is performed by individuals who can provide valuable feedback on the product. This usually takes a long time and the participants can be customers, partners or anyone unfamiliar with the manufacturing company. The key point to remember, as stressed by S. Lowry, is that the product is no longer a prototype and has almost all the features of a commercial product. There are several important goals to achieve at this stage:

First, check how much the customer is interested in the product. Pay attention to which individual product or service attribute they prefer and whether they would decide to buy. Under what conditions would they decide to buy?

You also need to observe how the customer uses the product and of course assess the durability of the product and its susceptibility to damage. This feedback will help you stay informed of any small design improvements that need to be made. The sales and marketing team will also benefit from field testing feedback, they can use this information to better target their sales presentation.

Secondly, it is necessary to analyse the buyers' readiness stage. If a small group of customers is interested in purchasing, it is worth asking yourself whether this is a too early stage to implement the product. It may be necessary to create a demand for the product, which may result in faster realisation of profits due to early customer acceptance. Research in this regard will allow an estimation of the size of the expected market for a new product in order to determine the initial production volume.

Thirdly, the objective is to implement a solid marketing plan and establish the product's ability to sell under the assumptions made in the plan. The goal is also to get an early sales forecast and to make any necessary adjustments to the marketing plan.

A robust marketing and go-to-market plan with confidence in a product's sale potential helps inform key decision makers during the testing and validation phase. If your marketing plans or launch plans are uncertain, there are two options to consider. First, you can conduct a simulated market test in which customers will be able to meet the new product in an advertising and purchasing situation. The purpose of this test is to get an early sales forecast and to make any necessary adjustments to the marketing plan. Another test is a trial sale run by specific channels, regions or consumer demographics.

Phase 5 - Launch, i.e., introducing the product to the market, is the culmination of the fact that the product has passed all the previous goals and is ready for commercialisation. Part of the go-to-market phase is to train your sales and support staff so that they know the product and can help you sell it. Determining the price of a product is an aspect of bringing a product to the market that the manufacturer must consider. They should avoid underestimating or overstating the potential market. Finally, distribution is the main decision-making element in the commissioning process. When selecting a value-added distributor or reseller for your product, you should carefully consider, taking into account potential sales. An efficient start-up process that includes effective marketing and a competent and prepared sales force can result in faster profits due to early customer acceptance.

Introducing a product to the market does not end the research process. This is an important stage from a marketing point of view. You have to closely observe customers' behaviour and their reactions to the product. Proposed methods of Phase 5 research and analysis:

1. Observation of behaviour, methods of use.
2. Voice of the Customer (VoC).
3. Customer Experience.
4. Analysis of the effectiveness of distribution channels.
5. Analysis of the effectiveness of promotional activities.
6. Collecting customer opinions on the product.

It is important to quickly analyse customer behaviour on an ongoing basis, analyse the behaviour of competitors, and react quickly to market signals.

## 5. Conclusions

A comprehensive analysis of the conducted research, both empirical and literature, as well as the authors' own reflections allow for the formulation of final conclusions:

1. There is currently no work methodology dedicated to start-ups from idea to commercialisation.
2. Key reasons for start-up failures and failures relate to marketing aspects, including misidentification of consumer needs, poor pricing policy, inappropriate product features, or the fact that the product is unintuitive and difficult to use, and poor promotion.
3. A significant problem is also the lack of a structured process dedicated to incubation. System control, properly designed checklists and gatekeeper teams are very important in the entire process.
4. The diagram of research methods based on Stage Gate indicated by the authors may contribute to elimination of the biggest problems of start-ups, as well as reducing the risk for investors investing in start-ups. Thanks to this, it can gain great popularity. It can be used by employees and executives of start-ups and training institutions educating management staff.

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