

Situation-specific Business Model Development Methods for Mobile App Developers* - Technical Report -

Sebastian Gottschalk, Enes Yigitbas, Alexander Nowosad, and Gregor Engels

Software Innovation Lab, Paderborn University, Germany
{sebastian.gottschalk,enes.yigitbas,gregor.engels}@uni-paderborn.de
anowosad@mail.uni-paderborn.de

Abstract. The development of effective business models is an essential task in highly competitive markets like mobile ecosystems. Existing development methods for these business models do not specifically bring into focus that the development process profoundly depends on the situation (e.g., market size, regulations) of the mobile app developer. Here, a mismatch between method and situation can lead to poor resource management and longer development cycles. In software engineering, soft-ware projects use situational method engineering to configure a development method out of a method repository based on the project situation. Analogously, we support creating situation-specific business model development methods with a method base and new user roles. Here, the method engineer obtains the domain expert’s knowledge and stores it in the method base as elements, building blocks, and patterns. We derive the expert knowledge from a grey literature review on mobile development processes. After this, the method engineer constructs the development method based on the described situation of the business developer.

In this technical report, we show the intermediate steps of our grey literature review together with the method elements, method building blocks, and method pattern of the method base.

Keywords: Business Model Development, Situational Method Engineering, Mobile App, Business Model Development Tools

1 Introduction

The development of effective business models, defined by Osterwalder et al. as “the rationale of how the organization creates, delivers, and captures value” [8], is an essential task for a company to stay competitive. This is one of the results of the GE Innovation Barometer 2018 [4], a study with over 2000 business

* This work was partially supported by the German Research Foundation (DFG) within the CRC “On-The-Fly Computing” (CRC 901, Project Number: 160364472SFB901) and the German Federal Ministry of Education and Research (BMBF) through Software Campus grant (Project Number: 01IS17046).

executives. In this study, 64% of these executives have the “difficulty to define an effective business model to support new ideas and make them profitable” [4]. An important reason for this is that customers expect solutions for perceived needs rather than just products [9]. These perceived needs correspond to the potential effect that the business model can be often more important than the latest technology of the product [2]. Attractive markets for companies are mobile ecosystems. As highlighted by the AppAnnie’s State in Mobile 2021 study [1], these ecosystems provided 218 billion app downloads that led to 142 billion dollar revenue just in 2020. Nevertheless, app developers compete with their app against millions of other apps over the users’ usage time. Therefore, effective business models are essential for staying successful in these markets.

Our paper [5] shows that the development of a business model depends on a business model development method. This method, in turn, profoundly depends on the situation (e.g., market size, regulations) of the mobile app developer. This situation, in turn, can take into account by using Situational Method Engineering (SME) [6]. SME has its origin in creating software development methods and typically consists of a method engineer and a project manager. Here, the method engineer analyzes various methods and stores them in a method base. After that, the method engineer identifies the project’s situational factors and constructs a suitable method of the method base. This method, in turn, is then enacted by the project manager to manage the project. Analogously, we introduce the creation of situation-specific business model development methods. For this, we have the three roles of the domain expert, the method engineer, and the business developer together with the two stages of creating the method base and constructing the development method. Here, the method engineer models the method base on the knowledge of the domain expert. After that, the method engineer constructs the development method out of the business developer’s described situation.

In this technical report, we show the three intermediate development steps (Planning the Review, Conducting the Review, Report the Review) of our approach based on the Grey Literature Review by Garousi et al. [3] and the created method base, which consists of method elements, method building blocks, and method patterns.

2 Research Approach

This paper introduces situation-specific business model development methods. We apply the approach for mobile app developers by providing a method base on practical knowledge outside the research world. To gather such knowledge systematically and repeatably, grey literature reviews (GLRs) have been introduced as a promising approach in the last years. GLRs, in turn, extract sources from non-scientific (called grey) sources instead of Systematic Literature Reviews (SLRs) [7], which originally cover just scientific (called white) literature. This coverage of grey literature allows us to transfer information from practical experiences (e.g., articles, blog posts) into the research world. Here, we follow the guidelines according to Garousi et al. [3], who structure the GLR in the

three phases of *Planning the Review*, *Conducting the Review*, and *Reporting the Review*.

2.1 Planning the Review

In *Planning the Reviews*, a GLR needs to be motivated together with the explicit formulation of the research question the study aims to answer. Out of the research question, the search string and related inclusion and exclusion criteria are determined. To motivate the need for the GLR, we have used the checklist of Garousi et al. [3]. In this checklist, the authors offer different questions to decide if a GLR should be conducted. Because we are considering a complex subject with a lack of practical experience in the formal literature, we concluded that a GLR is appropriate. The whole checklist can be accessed in Table 1.

Table 1. Checklist for Conduction the Grey Literature Review by Garousi et al. [3]

Identifier	Question	Answer
1	Is the subject complex and not solvable by considering only the formal literature?	Yes
2	Is there a lack of volume or quality of evidence, or a lack of consensus of outcome measurement in the formal literature?	No
3	Is the contextual information important to the subject under study?	Yes
4	Is it the goal to validate or corroborate scientific outcomes with practical experiences?	No
5	Is it the goal to challenge assumptions or falsify results from practice using academic research or vice versa?	No
6	Would a synthesis of insights and evidence from the industrial and academic community be useful to one or even both communities?	Yes
7	Is there a large volume of practitioner sources indicating high practitioner interest in a topic?	Yes

To fill our method base with specific development methods of business models for mobile app developers, we have defined the following research question:

- **RQ:** What are the main business model development steps that need to be done by a mobile app developer?

To answer this question and by testing different search terms with the terminology in business model development, we have defined the following search string:

- **Search String:** app AND (business model OR idea) AND (test OR validate OR develop)

Moreover, we provide the following inclusion and exclusion criteria:

- **Inclusion:**

- The article is written in English.
- The URL is accessible, and the content freely available.
- The article directly relates to the specified research question.
- **Exclusion:**
 - The article provides no process for business model development.
 - The article does not relate to the topic of mobile applications.
 - The content is a posting in a community (e.g., forum, q&a site).
 - The content is presented in a non-textual form.

2.2 Conduction the Review

In *Conducting the Review*, the review needs to be conducted by considering the search process, the source selection, the quality assessment, the data extraction, and the data synthesis. In the search process, we apply the search string to the Google search engine on January 19th, 2021. Before starting the search, we use our browser’s private mode, select English as our standard language, and use a VPN in the United States to provide the maximum of objective results. We export the first 50 results of the search results, which can be seen in Appendix A. After a manual scan of the inclusion and exclusion criteria, we got 38 results. The included and excluded websites can be seen in Table 2.

Table 2. Included/Excluded Websites in our Approach

Type	Website Identifier
Included	[W1], [W2], [W3], [W4], [W5], [W6], [W8], [W9], [W10], [W11], [W13], [W14], [W16], [W17], [W19], [W20], [W22], [W24], [W25], [W27], [W29], [W33], [W34], [W37], [W40], [W42], [W43], [W44], [W45], [W48], [W49], [W50]
Excluded	[W7], [W12], [W15], [W18], [W21], [W23], [W26], [W28], [W30], [W31], [W32], [W35], [W36], [W38], [W39], [W41], [W46], [W47]

Because during the manual check, we invest a relatively fast saturation of new knowledge, we do not apply snowballing inside our literature review. Therefore, we got a final pool of 38 results. For the quality assessment, the essential criteria were the understandability of the provided processes. Moreover, the method base will contain links to the articles so that mobile app developers can convince themselves of the quality. After analyzing the first results, we found the division between atomic blocks (i.e., method elements), combined steps (i.e., method building blocks), and their different orderings (i.e., method patterns), which we chose as initial attributes. We were iteratively refining our initial attribute method elements into the atomic parts of tasks, types, stakeholders, situational factors, artifacts, and tools. Based on these atomic elements, we extracted all method elements in the data extraction. We do this by discovering all results and write down the whole process with its steps and atomic blocks. At this step, we also analyzed the meaning of the process steps to unify the same steps presented

under different terms. Out of these process steps, in the synthesis, we synthesize the atomic block (i.e., method elements) and the process steps themselves (i.e., building blocks). Moreover, we synthesize the ordering of these process steps (i.e., method pattern) to allow a flexible but controlled construction of the business model development method.

2.3 Reporting the Review

In *Reporting the Review*, the results of the review need to be documented. We do this by publishing the highlights of our results in this research paper and providing access to the whole method base in this technical report. The whole method base consists of 234 method elements, 57 method building blocks, and 26 method patterns.

3 Method Base

The method base can be divided into the *Method Elements*, the *Method Building Blocks* and the *Method Pattern*.

3.1 Method Elements

The method elements are atomic parts of the methods that can be divided into the categories of *Tasks*, *Types*, *Stakeholders*, *Situational Factors*, *Artifacts* and *Tools*.

Task The *Tasks* are the main activities that need to be performed during the business model development processes.

– Discovery

- Target Audience Identification
- Persona Creation
- Customer Journey Map Creation
- Trend Discovery
- Store Trend Discovery
- Keyword Discovery
- Store Keyword Discovery
- Market Problem Observation
- Own Problem Observation
- Event Attention
- Social Media Discovery
- Online Community Discovery
- Interview Conduction
- Group Interview Conduction
- Customer Interview Conduction
- Expert Interview Conduction

- Survey Conduction
- Social Media Survey Conduction
- Forum Survey Conduction
- **Analysis**
 - Market Potential Analysis
 - Keyword Analysis
 - Store Keyword Analysis
 - Competitor Analysis
 - Store Competitor Analysis
 - Store Competitor Feature Set analysis
 - Store Competitor Business Model Analysis
 - Problem Sharping
 - Target Group Sharping
- **Design**
 - Feature Set Creation
 - Value Proposition Development
 - Business Model Development
 - Monetization Strategy Identification
 - Marketing Strategy Identification
 - Unique Selling Point Identification
 - Feature Set Priorisation
 - Hypothesis Priorisation
 - SWOT Analysis
 - Metric Identification
 - Competitive Advantage Analysis
- **Develop**
 - Inbound Marketing Conduction
 - Outbound Marketing Conduction
 - Website Creation
 - Landing Page Creation
 - Information Creation
 - Organic Traffic Generation
 - Inorganic Traffic Generation
 - Prototype Development
 - Mockup Development
 - Proof-of-Concept Development
 - Wireframe Development
 - MVP Development
 - Plattform Selction
 - Cost Estimation
 - Financing Search
 - Internal Development
 - External Development
 - Platform Publishing
- **Validate**
 - Interview Conduction

- Group Interview Conduction
- Customer Interview Conduction
- Expert Interview Conduction
- Survey Conduction
- Social Media Survey Conduction
- Forum Survey Conduction

Types The *Types* are used to structure the building blocks and pattern. They can be divided into *Functional Types*, *Structure Types*, and *Method Types*.

- **initialisation**
- **generic**
- **discovery**
 - customerDiscovery
 - customerIdentification
 - customerAnalysis
 - problemDiscovery
 - problemIdentification
 - problemAnalysis
- **analysis**
 - marketAnalysis
 - competitorAnalysis
 - nicheAnalysis
- **design**
 - ideaIdentification
 - featureDesign
 - businessDesign
 - vpDesign
 - bmDesign
 - monetizationDesign
 - marketingDesign
 - uspDesign
 - enhancementDesign
- **develop**
 - marketingDevelopment
 - contentDevelopment
 - createContent
 - spreadContent
 - prototypeDevelopment
 - platformSelection
 - financialCheck
 - productDevelopment
 - platformPublishing
- **validate**
 - intermediateValidation

Stakeholders The *Stakeholders* are the persons who are involved in the building blocks. We can divide between the own *Company*, existing *Partners*, and potential *Users*.

- **Company**
 - Business Developer
 - Software Developer
 - Marketing Manager
 - Designer
- **Partners**
 - Development Agency
 - Design Agency
 - Investor
 - Blogger & Reporter
- **Users**
 - Customer
 - Expert
 - Early Adopter
 - Family & Friends

Situational Factors The *Situational Factors* are used to classify in which context a building block or pattern can be applied. They can be categorized by the own *Company*, the identified *Problem*, the potential *Customer*, the targeted *Market*, the developed *Product*, and the state of the *Phase*.

- **Company**
 - domainExpertise: low, medium, high
 - timeResources: low, medium, high
 - financialResources: low, medium, high
 - businessModelingSkills: low, medium, high
 - developmentSkills: low, medium, high
 - designSkills: low, medium, high
 - marketingSkills: low, medium, high
- **Problem**
 - problemSpace: low, medium, high
 - problemComplexity: low, medium, high
- **Customer**
 - customerSegment: uniform, divers
 - customerGroup: private, business
- **Market**
 - marketSize: niche, mass
 - marketType: b2b, b2c
 - marketCompetitors: low, medium, high
- **Product**
 - productSpace: low, medium, high
 - productComplexity: low, medium, high
 - productFeasibility: low, medium, high

– **Phase**

- processSpeed: low, medium, high
- problemValidity: low, medium, high
- customerValidity: low, medium, high
- productFeatureValidity: low, medium, high
- businessModelValidity: low, medium, high

Artifacts The artifacts are working products that are created and modified during the process development process. They can be categorized into *Structured Information*, *Information*, *Mediums*, *Prototypes*, and *Products*. While most of them are found in the literature, the *Information* are just basic containers to transfer the data between the building blocks.

– **Structured Information**

- User Persona Map
- Customer Journey Map
- SWOT Map
- Business Model Canvas
- Value Proposition Canvas
- Feature Set

– **Information**

- Customer Information
- Problem Information
- Market Information
- Competitor Information
- App Information
- Marketing Information

– **Medium**

- Website
- Landing Page
- Blog
- Social Media Profile

– **Prototype**

- Proof-of-Concept
- Sketch
- Mockup
- Wireframe
- Minimum Viable Product

– **Product**

- iOS App
- Android App
- Web App

Tools The tools are used to support the performing of the identified tasks. For this, the tool can directly support the task or create and modify the artifacts.

- **Social Media Tools**
 - Reddit
 - Quora
 - Facebook
 - Instagram
 - Twitter
 - LinkedIn
- **Online Communities**
 - Specialized Forums
 - Facebook Groups
- **Content Tools**
 - AngelList
 - Product Hunt
 - App Review Websites
- **Keyword Analysis Tools**
 - Google Keyword Planning Tool
 - Moz Planner
 - UberSuggest
- **Trend Discovery Tools**
 - Google Trends
 - YCombinator
 - AngelList
 - ProductHunt
 - KickStarter
 - TechCrunch
 - Forbes
 - TrendsWatching
- **Search Engines**
 - Google
 - Bing
- **Stores**
 - Apples AppStore
 - Google PlayStore
- **Prototyping Tools**
 - Balsamiq
 - PowerPoint
 - Photoshop
- **Landing Page Tools**
 - Undelay
 - Themeforest
- **Survey Tools**
 - Survey Monkey
 - Google Survey
 - PickUp

- **Feature Set Tools**
 - Microsoft Word
 - Microsoft Excel
- **Store Statistic Tools**
 - AppAnnie
 - SensorTower
 - AppTweak
- **Social Media Ads**
 - Twitter Polls
 - Facebook Ads
 - Instagram Ads
- **Search Engine Ads**
 - Google Adwords
 - Bing Ads

3.2 Method Building Blocks

This is the collection of business model method blocks that we derived from the grey literature review. Each building block contains a name, a short description, the involved stakeholder, situation factors, types together with inputs and outputs for artifacts. Moreover, we provide links to articles of our grey literature review where the method building blocks are explained in more detail. To structure input artifacts, output artifact, and tools, we use the following notations:

- *Category**: Abstract artifact or tool out of the category
- (*Category*): List of artifacts or tools of the category

Target Audience Identification The goal of this building block is to identify the target audience of your apps. This identification, in turn, will support the development of an app that directly fits the specific needs of the customer group.

- **Types**
 - customerIdentification
- **Stakeholders**
 - Business Developer
- **Situational Factors**
- **Input Artifacts**
- **Output Artifacts**
 - Customer Information
- **Tools**

Persona Creation The goal of this building block is to create a concrete user persona out of the abstract gathered customer information. This, in turn, allows you to make first assumptions about the app's specific users and identify the ideal customer.

- **Types**
 - customerAnalysis
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - customerSegment: divers
- **Input Artifacts**
 - Customer Information
- **Output Artifacts**
 - User Persona Map
- **Tools**

Customer Journey Map Creation The goal of this building block is to discover the behavior of the customer and analyze at which points he will interact with the app. This will help you to make assumptions about the user flow of the application.

- **Types**
 - customerAnalysis
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - customerSegment: divers
 - marketSize: niche
- **Input Artifacts**
 - Customer Information
- **Output Artifacts**
 - Customer Journey Map
- **Tools**

Trend Discovery The goal of this building block is to gather information about current trends in the industry. This could be a mix of new products, founded companies, or general ongoing trends.

- **Types**
 - problemIdentification
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - problemSpace: low
 - problemValidity: low
- **Input Artifacts**
- **Output Artifacts**
 - Problem Information
- **Tools**
 - (Trend Discovery Tools*)

Store Trend Discovery The goal of this building block is to gather information about current trends in the stores. These could be recommended apps by the store provider or lists of top-downloaded or top-grossing apps. The discovery can be made by hand or with external tools.

- **Types**
 - problemIdentification
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - problemSpace: low
 - problemValidity: low
- **Input Artifacts**
- **Output Artifacts**
 - Problem Information
- **Tools**
 - (Stores*)
 - (Store Statistic Tools*)

Keyword Discovery The goal of this building block is to discover possible problems and their solutions for different keywords in the area you want to develop an app for. The discovery can be made directly with the search engines or specific keyword tools.

- **Types**
 - problemIdentification
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - problemSpace: low
- **Input Artifacts**
- **Output Artifacts**
 - Problem Information
- **Tools**
 - (Search Engines*)
 - (Keyword Analysis Tools*)

Store Keyword Discovery The goal of this building block is to discover apps and the problems they try to solve instead of the stores based on your own keywords. For this, you can discover the apps and their reviews directly or use a store analysis tool.

- **Types**
 - problemIdentification
- **Stakeholders**
 - Business Developer
- **Situational Factors**

- problemSpace: low
- **Input Artifacts**
- **Output Artifacts**
 - Problem Information
- **Tools**
 - (Stores*)
 - (Store Statistic Tools*)

Market Problem Observation The goal of this building block is to observe an existing market to gather insights about current existing problems. This can be made by discovering existing processes or speaking directly to involved persons.

- **Types**
 - problemIdentification
- **Stakeholders**
 - Business Developer
 - Users*
- **Situational Factors**
 - problemSpace: low
 - processSpeed: low
 - marketType: b2b
- **Input Artifacts**
- **Output Artifacts**
 - Problem Information
- **Tools**

Own Problem Observation The goal of this building block is to observe problems in the own environment to identify the workarounds which are currently done to solve them. For this, you can discover for own life situation for a certain amount of time and note down repeating problems.

- **Types**
 - problemIdentification
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - problemSpace: low
 - processSpeed: low
 - marketType: b2b
- **Input Artifacts**
- **Output Artifacts**
 - Problem Information
- **Tools**

Event Attention The goal of this building block is to discover problems from external persons or discuss potential ideas with other persons with the same interest. For this, you can attend different events like hackathons, startup meetings, or business conferences.

- **Types**
 - problemIdentification
 - ideaIdentification
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - marketSize: mass
 - processSpeed: medium
 - timeResources: medium
- **Input Artifacts**
- **Output Artifacts**
 - Problem Information
 - App Information
- **Tools**

Social Media Discovery The goal of this building block is to discover the problems of potential customers in social media posting. Social media websites have a mass amount of users who claim about possible problems in a daily manner.

- **Types**
 - problemIdentification
 - ideaIdentification
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - problemSpace: low
 - processSpeed: low
 - timeResources: high
- **Input Artifacts**
- **Output Artifacts**
 - Problem Information
 - App Information
- **Tools**
 - (Social Media Tools*)

Online Community Discovery The goal of this building block is to discover the problems of potential customers in a specific niche. For this, online communities within this niche can be visited, and problems can be collected.

- **Types**
 - problemIdentification
 - ideaIdentification
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - problemSpace: low
 - processSpeed: low
 - timeResources: high
 - marketSize: niche
- **Input Artifacts**
- **Output Artifacts**
 - Problem Information
 - App Information
- **Tools**
 - (Online Communities*)

Interview Conduction The goal of this building block is to conduct interviews with single persons. Single Interviews can be used to get a deeper understanding of the problem and validate possible steps during the business model development process.

- **Types**
 - problemAnalysis
 - ideaIdentification
 - intermediateValidation
 - analysis
 - validate
- **Stakeholders**
 - Business Developer
 - User*
- **Situational Factors**
 - processSpeed: medium
 - timeResources: high
- **Input Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Output Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Tools**

Group Interview Conduction The goal of this building block is to conduct group interviews with different persons. Group interviews can be used to discover and analyze problems of different persons at a single time and validate possible steps during the development at a single time.

- **Types**
 - problemAnalysis
 - ideaIdentification
 - intermediateValidation
 - analysis
 - validation
- **Stakeholders**
 - Business Developer
 - User*
- **Situational Factors**
 - processSpeed: low
 - timeResources: low
- **Input Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Output Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Tools**

Customer Interview Conduction The goal of this building block is to conduct interviews with potential customers of the app. The interviews can be used to discover and analyze the current problems or validate different steps of the development process.

- **Types**
 - problemAnalysis
 - ideaIdentification
 - intermediateValidation
 - analysis
 - validation
- **Stakeholders**
 - Business Developer
 - Customer
- **Situational Factors**
 - processSpeed: medium
 - timeResources: medium
 - problemComplexity: medium

- productComplexity: medium
- domainExpertise:medium
- **Input Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Output Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Tools**

Expert Interview Conduction The goal of this building block is to conduct interviews with experts of the domain. The interviews can be used to discover and analyze the current problems or validate different steps of the development process.

- **Types**
 - problemAnalysis
 - ideaIdentification
 - intermediateValidation
 - analysis
 - validation
- **Stakeholders**
 - Business Developer
 - Customer
- **Situational Factors**
 - processSpeed: medium
 - timeResources: medium
 - marketSize: niche
 - problemComplexity: high
 - productComplexity: high
 - domainExpertise:low
- **Input Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Output Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Tools**

Survey Conduction The goal of this building block is to conduct surveys with different persons. Surveys can be used to research a high number of persons with standardized questions about the problem, possible ideas, or different developed prototypes.

- **Types**
 - problemAnalysis
 - ideaIdentification
 - intermediateValidation
 - analysis
 - validation
- **Stakeholders**
 - Business Developer
 - User*
- **Situational Factors**
 - processSpeed: medium
 - timeRessources: low
- **Input Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Output Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Tools**
 - Survey Tools*

Social Media Survey Conduction The goal of this building block is to conduct surveys with different customers on social media websites. Social media surveys allow discovering a high number of results for mass-market apps.

- **Types**
 - problemAnalysis
 - ideaIdentification
 - intermediateValidation
 - analysis
 - validation
- **Stakeholders**
 - Business Developer
 - Customer
- **Situational Factors**
 - processSpeed: medium
 - timeRessources: low
 - marketSize: mass

- productComplexity: low
- problemComplexity: low
- **Input Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Output Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Tools**
 - Survey Tools*
 - (Social Media Tools*)

Online Communities Survey Conduction The goal of this building block is to conduct surveys with different customers in online communities. Forums allow discovering a medium number of specific results for niche market apps.

- **Types**
 - problemAnalysis
 - ideaIdentification
 - intermediateValidation
 - analysis
 - validation
- **Stakeholders**
 - Business Developer
 - Customer
- **Situational Factors**
 - processSpeed: medium
 - timeRessources: low
 - marketSize: niche
 - productComplexity: medium
 - problemComplexity: medium
- **Input Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Output Artifacts**
 - (Structured Information*)
 - (Information*)
 - Prototype*
 - Product*
- **Tools**
 - Survey Tools*
 - (Online Communities*)

Market Potential Analysis The goal of this building block is to analyze the potential size of the target market. The goal is to identify a market's high growth potential together with growth drivers and possible barriers.

- **Types**
 - marketAnalysis
 - analysis
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - timeRessources: medium
 - marketSize: niche
- **Input Artifacts**
 - Customer Information, Problem Information
- **Output Artifacts**
 - Market Information
- **Tools**

Keyword Analysis The goal of this building block is to analyze the traffic and results for specific keywords that target your customer and problem. With the help of keyword analysis, it is possible to look if many such people are searching for the problem and can be therefore targeted with search engine optimization.

- **Types**
 - marketAnalysis
 - analysis
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - timeRessources: low
 - marketSize: niche
- **Input Artifacts**
 - Customer Information, Problem Information
- **Output Artifacts**
 - Market Information
- **Tools**
 - (Search Engines*)
 - Keyword Analysis Tools*

Store Keyword Analysis The goal of this building block is to analyze the traffic and results for specific keywords within the stores. With the help of keyword analysis, it is possible to look if many such people are searching for the problem and which solutions are currently offered.

- **Types**
 - marketAnalysis
 - analysis
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - timeRessources: low
 - marketSize: niche
- **Input Artifacts**
 - Customer Information, Problem Information
- **Output Artifacts**
 - Market Information
- **Tools**
 - (Stores*)
 - Store Statistic Tools*

Competitor Analysis The goal of this building block is to analyze the competitors based on the gained insights of customers and problems. The competitor analysis can be used to identify target customers and used features to create a competitive advantage.

- **Types**
 - competitorAnalysis
 - analysis
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - timeRessources: medium
 - marketCompetitors: medium
- **Input Artifacts**
 - Customer Information, Problem Information
- **Output Artifacts**
 - Competitor Information
- **Tools**

Store Competitor Analysis The goal of this building block is to analyze the store competitors based on the gained insights of customers and problems. The competitor analysis can be used to identify target customers and used features to create a competitive advantage.

- **Types**
 - competitorAnalysis
 - analysis
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - timeResources: medium
 - marketCompetitors: medium
- **Input Artifacts**
 - Customer Information, Problem Information
- **Output Artifacts**
 - Competitor Information
- **Tools**
 - (Stores*)

Store Competitor Feature Set Analysis The goal of this building block is to analyze the store competitors based on the gained insights of customers and problems. The competitor analysis can be used to identify the commonly used features.

- **Types**
 - competitorAnalysis
 - analysis
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - timeResources: medium
 - marketCompetitors: medium
- **Input Artifacts**
 - Customer Information, Problem Information
- **Output Artifacts**
 - (Feature Set)
- **Tools**
 - (Stores*)

Store Competitor Business Model Analysis The goal of this building block is to analyze the store competitors based on the gained insights of customers and problems. The competitor analysis can be used to identify the commonly used parts of the business model.

- **Types**
 - competitorAnalysis
 - analysis
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - timeResources: medium
 - marketCompetitors: medium
- **Input Artifacts**
 - Customer Information, Problem Information
- **Output Artifacts**
 - (Business Model Canvas)
- **Tools**
 - (Stores*)

Problem Sharping The goal of this building block is to sharp the problem after the analysis of the market and the competitors. This, in turn, should help to concentrate on a single concrete problem instead of trying to solve multiple problems at the same time.

- **Types**
 - nicheAnalysis
 - analysis
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - problemComplexity: high
- **Input Artifacts**
 - Problem Information
- **Output Artifacts**
 - Problem Information
- **Tools**

Target Group Sharping The goal of this building block is to sharp the target group after the analysis of the market and the competitors. This, in turn, should help to concentrate on a specific group instead of trying to solve the problem for multiple diverse groups.

- **Types**
 - nicheAnalysis
 - analysis
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - customerSegment: divers
- **Input Artifacts**
 - Customer Information
- **Output Artifacts**
 - Customer Information
- **Tools**

Feature Set Creation The goal of this building block is to create a set of features that the app should have. This set can be created out of the insights during the discovery and analysis phase.

- **Types**
 - featureDesign
- **Stakeholders**
 - Business Developer
- **Situational Factors**
- **Input Artifacts**
 - Customer Information, Problem Information, Market Information, Competitor Information
- **Output Artifacts**
 - Feature Set
 - App Information
- **Tools**
 - Feature Set Tools*

Value Proposition Development The goal of this building block is to develop a value proposition for the customer. For this, a value proposition canvas is filled out with the insights of the discovery and analysis phase.

- **Types**
 - vpDesign
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - businessModelingSkills: medium
- **Input Artifacts**
 - Customer Information, Problem Information, Market Information, Competitor Information
- **Output Artifacts**
 - Value Proposition Canvas
- **Tools**

Business Model Development The goal of this building block is to develop a business model for the app. For this, a business model canvas is filled out with the insights of the discovery and analysis phase.

- **Types**
 - bmDesign
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - businessModelingSkills: medium
- **Input Artifacts**
 - Customer Information, Problem Information, Market Information, Competitor Information
- **Output Artifacts**
 - Business Model Canvas
- **Tools**

Monetization Strategy Identification The goal of this building block is to identify a monetization strategy for the app. This strategy, in turn, should ensure the sustainable development of the app over time.

- **Types**
 - monetizationDesign
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - businessModelingSkills: low
- **Input Artifacts**
 - App Information
- **Output Artifacts**
 - App Information
- **Tools**

Marketing Strategy Identification The goal of this building block is to identify a marketing strategy for the app. This strategy, in turn, should ensure to reach potential customers with a corresponding sales funnel.

- **Types**
 - marketingDesign
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - businessModelingSkills: low
- **Input Artifacts**
 - App Information
- **Output Artifacts**
 - App Information
- **Tools**

Unique Selling Point Identification The goal of this building block is to identify a unique selling point for the app. This unique selling point, in turn, will ensure a competitive advantage against similar apps in the market.

- **Types**
 - uspDesign
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - businessModelingSkills: low
- **Input Artifacts**
 - App Information
- **Output Artifacts**
 - App Information
- **Tools**

Feature Set Priorisation The goal of this building block is to prioritize the feature set according to the most important features. This should ensure to consider only the most important features at the beginning of your app development.

- **Types**
 - enhancementDesign
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - productComplexity: high
- **Input Artifacts**
 - Feature Set
 - App Information
- **Output Artifacts**
 - Feature Set
 - App Information
- **Tools**
 - Feature Set Tools*

Hypothesis Priorisation The goal of this building block is to prioritize the hypotheses inside your developed business model to find out the most important ones. The most important hypotheses should be tested at the beginning to ensure the development of a successful app.

- **Types**
 - enhancementDesign
- **Stakeholders**
 - Business Developer
- **Situational Factors**
 - productComplexity: high
- **Input Artifacts**
 - Business Model Canvas
 - App Information
- **Output Artifacts**
 - Business Model Canvas
 - App Information
- **Tools**

SWOT Analysis The goal of this building block is to conduct a SWOT Analysis to identify the strengths, weaknesses, opportunities, and threats of your application. This analysis can be used to improve the feature set and business model of the application.

- **Types**
 - enhancementDesign
- **Stakeholders**
 - Business Developer
- **Situational Factors**
- **Input Artifacts**
 - Business Model Canvas, Feature Set
 - App Information
- **Output Artifacts**
 - SWOT Map
- **Tools**

Metric Identification The goal of this building block is to identify important metrics to measure the success of the app. These metrics can be derived from the feature set and the business model of the application.

- **Types**
 - enhancementDesign
- **Stakeholders**
 - Business Developer
- **Situational Factors**
- **Input Artifacts**
 - (Business Model Canvas), (Feature Set)
 - App Information
- **Output Artifacts**
 - Business Model Canvas, Feature Set
 - App Information
- **Tools**

Competitive Advantage Analysis The goal of this building block is to analyze the competitive advantage of the own application. This analysis, in turn, should ensure to focus on these advantages during the beginning of the development.

- **Types**
 - enhancementDesign
- **Stakeholders**
 - Business Developer
- **Situational Factors**
- **Input Artifacts**
 - (Business Model Canvas), (Feature Set)
 - App Information, Competitor Information
- **Output Artifacts**
 - Business Model Canvas, Feature Set
 - App Information
- **Tools**

Inbound Marketing Conduction The goal of this building block is to conduct inbound marketing during the development phase. Inbound marketing means to active creation of valuable content that potential customers can discover during the search for solutions to their problems.

- **Types**
 - marketingDevelopment
- **Stakeholders**
 - Marketing Manager
- **Situational Factors**
 - marketingSkills: medium
 - timeResources: medium
- **Input Artifacts**
 - Marketing Information
- **Output Artifacts**
 - Marketing Information
- **Tools**

Outbound Marketing Conduction The goal of this building block is to conduct outbound marketing during the development phase. Outbound marketing means to direct push the potential customers to the current state of the solution.

- **Types**
 - marketingDevelopment
- **Stakeholders**
 - Marketing Manager
- **Situational Factors**
 - marketingSkills: medium
 - timeResources: medium
- **Input Artifacts**
 - Marketing Information
- **Output Artifacts**
 - Marketing Information
- **Tools**

Website Creation The goal of this building block is to create a website to show the current state of the app. On the website, it is also possible to share valuable content related to the problem and the solution.

- **Types**
 - createContent
- **Stakeholders**
 - Marketing Manager
 - Designer
 - Software Developer
- **Situational Factors**
 - marketingSkills: low

- designSkills: medium
- developmentSkills: medium
- timeResources: medium
- **Input Artifacts**
 - Marketing Information
- **Output Artifacts**
 - Marketing Information, Website
- **Tools**

Landing Page Creation The goal of this building block is to create a landing page to show the unique selling point of the app. The landing page can be used to analyze conversion rates of different UPSs and collect mail addresses for further interaction.

- **Types**
 - createContent
- **Stakeholders**
 - Marketing Manager
 - Designer
 - Developer
- **Situational Factors**
 - marketingSkills: low
 - designSkills: medium
 - developmentSkills: medium
 - timeResources: medium
- **Input Artifacts**
 - Marketing Information
- **Output Artifacts**
 - Marketing Information, Landing Page
- **Tools**
 - Landing Page Tools*

Information Creation The goal of this building block is to create valuable information for the target customers on social media channels. This, in turn, helps to build a brand before starting with the product selling.

- **Types**
 - createContent
- **Stakeholders**
 - Marketing Manager
- **Situational Factors**
 - marketingSkills: medium
 - timeResources: medium
- **Input Artifacts**
 - Marketing Information
- **Output Artifacts**
 - Marketing Information
- **Tools**
 - (Social Media Tools*)

Organic Traffic Generation The goal of this building block is to generate organic traffic for the created content. This can be done by optimizing the content for search engines posting links to the content of social media platforms and forums.

- **Types**
 - spreadContent
- **Stakeholders**
 - Marketing Manager
- **Situational Factors**
 - marketingSkills: medium
 - timeResources: high
- **Input Artifacts**
 - Marketing Information
- **Output Artifacts**
 - Marketing Information
- **Tools**
 - (Social Media Tools*)
 - (Online Communities*)

Inorganic Traffic Generation The goal of this building block is to generate inorganic traffic for the created content. This can be done by advertising the app of search engines or social media websites.

- **Types**
 - spreadContent
- **Stakeholders**
 - Marketing Manager
- **Situational Factors**
 - marketingSkills: medium
 - timeResources: high
 - financialResources: medium
- **Input Artifacts**
 - Marketing Information
- **Output Artifacts**
 - Marketing Information
- **Tools**
 - (Social Media Ads*)
 - (Search Engine Ads*)

Prototype Development The goal of this building block is to develop a prototype of the app. This prototype can be created in various forms like sketches, mockups, wireframes, or clickable prototypes.

- **Types**
 - prototypDevelopment, development
- **Stakeholders**
 - Business Developer
 - Designer
 - Software Developer
- **Situational Factors**
- **Input Artifacts**
 - Feature Set
 - App Information
- **Output Artifacts**
 - Prototype*
- **Tools**
 - Prototyping Tools*

Proof-of-Concept Development The goal of this building block is to develop a proof-of-concept of the app. This should ensure the technical feasibility of developing the features of the app.

- **Types**
 - prototypDevelopment, development
- **Stakeholders**
 - Business Developer
 - Software Developer
- **Situational Factors**
 - developmentSkills: high
 - productFeasibility: low
- **Input Artifacts**
 - Feature List
 - App Information
- **Output Artifacts**
 - Proof-of-Concept
- **Tools**

Mockup Development The goal of this building block is to create a mockup of the app. A mockup is a graphical representation to give the potential customer an impression of who the app will look like.

- **Types**
 - prototypDevelopment, development
- **Stakeholders**
 - Business Developer
 - Designer

- **Situational Factors**
 - developmentSkills: medium
 - timeResources: low
 - productComplexity: low
- **Input Artifacts**
 - Feature List
 - App Information
- **Output Artifacts**
 - Mockup
- **Tools**

Wireframe Development The goal of this building block is to create a wireframe of the app. A wireframe is a visualization of the app that allows the potential customer to understand the navigation inside the app.

- **Types**
 - prototypDevelopment, development
- **Stakeholders**
 - Business Developer
 - Designer
- **Situational Factors**
 - developmentSkills: medium
 - timeResources: medium
 - productComplexity: high
- **Input Artifacts**
 - Feature List
 - App Information
- **Output Artifacts**
 - Wireframe
- **Tools**

MVP Development The goal of this building block is to create a minimum viable product of the app. An MVP is a small product that can be directly used by the potential customer to solve his problem.

- **Types**
 - prototypDevelopment, development
- **Stakeholders**
 - Business Developer
 - Designer
 - Developer
- **Situational Factors**
 - developmentSkills: medium
 - timeResources: medium
- **Input Artifacts**
 - Feature List
 - App Information
- **Output Artifacts**
 - Minimum Viable Product
- **Tools**

Platform Selection The goal of this building block is to select a platform where the app should be running. An app can be developed for a specific mobile platform or as a web app.

- **Types**
 - platformSelection
- **Stakeholders**
 - Business Developer
 - Developer
- **Situational Factors**
- **Input Artifacts**
 - Business Model Canvas
 - App Information
- **Output Artifacts**
 - Business Model Canvas, Feature List
 - App Information
- **Tools**

Cost Estimation The goal of this building block is to estimate the costs that the development of the app will cost.

- **Types**
 - financialCheck
- **Stakeholders**
 - Business Developer
 - Developer
 - Development Agency
- **Situational Factors**
- **Input Artifacts**
 - Business Model Canvas
 - App Information
- **Output Artifacts**
 - Business Model Canvas, Feature List
 - App Information
- **Tools**

Financing Search The goal of this building block is to clarify the finances of the app development.

- **Types**
 - financialCheck
- **Stakeholders**
 - Business Developer
 - Investor
- **Situational Factors**
- **Input Artifacts**
 - Business Model Canvas
 - App Information
- **Output Artifacts**
 - Business Model Canvas, Feature List
 - App Information
- **Tools**

Internal Development The goal of this building block is to develop the first version of the app. Internal developers will do this development.

- **Types**
 - productDevelopment
- **Stakeholders**
 - Business Developer
 - Developer
 - Designer
- **Situational Factors**
 - developmentSkills: high
 - financialResources: low
 - timeResources: high
- **Input Artifacts**
 - Feature List
 - App Information
- **Output Artifacts**
 - (Product*)
- **Tools**

External Development The goal of this building block is to develop the first version of the app. External developers will do this development.

- **Types**
 - productDevelopment
- **Stakeholders**
 - Business Developer
 - Development Agency
 - Designer
- **Situational Factors**
 - developmentSkills: low
 - financialResources: high
 - timeResources: low
- **Input Artifacts**
 - Feature List
 - App Information
- **Output Artifacts**
 - (Product*)
- **Tools**

Platform Publishing The goal of this building block is to publish the product on the selected platforms.

- **Types**
 - platformPublishing
- **Stakeholders**
 - Business Developer
 - Developer
- **Situational Factors**
- **Input Artifacts**
 - Business Model Canvas, Feature Set
 - App Information
 - (Product*)
- **Output Artifacts**
 - (Product*)
- **Tools**
 - (Stores*)

3.3 Method Pattern

This is the collection of business model patterns that we derived from the grey literature review. We use the following notation to structure the pattern:

- *o*: Start of the process pattern
- *x*: End of the process pattern
- - >: Next process step
- + >: Next process step or previous process step
- *AND*: Parallel creation of method building blocks
- *OR*: Alternative creation of method building blocks
- << *type*x >>: Method building block with type x
- << *type*x* >>: Method building block or method pattern with type x
- << *initialisation* >>: Can be used at the beginning of the process construction
- << *generic* >>: Can be used at every type and can inherit these parent type by using << *generic* >> inside the pattern

Business Model Initialisation Pattern This pattern allows the creation of a fixed process to create and validate a business model for a mobile application. Therefore, the process is particularly suitable for developers who have little experience with the creation of business models.

- **Type**
 - initialisation
- **Situational Factors**
 - businessModelingSkills: low
- **Pattern**
 - $o- ><< \textit{discovery*} >> - ><< \textit{analysis*} >> + ><< \textit{design*} >> + ><< \textit{develop*} >> + ><< \textit{validate*} >> + > x$

Business Model Discovery Initialisation Pattern This pattern allows the flexible creation of a process for business model development starting at the discovery phase. Due to this flexibility, it should be used only by experts in business model development.

- **Type**
 - initialisation
- **Situational Factors**
 - businessModelingSkills: high
- **Pattern**
 - $o- \gg \ll discovery* \gg - \gg x$

Business Model Analysis Initialisation Pattern This pattern allows the flexible creation of a process for business model development starting at the analysis phase. Due to this flexibility, it should be used only by experts in business model development.

- **Type**
 - initialisation
- **Situational Factors**
 - businessModelingSkills: high
- **Pattern**
 - $o- \gg \ll analysis* \gg - \gg x$

Business Model Design Initialisation Pattern This pattern allows the flexible creation of a process for business model development starting at the design phase. Due to this flexibility, it should be used only by experts in business model development.

- **Type**
 - initialisation
- **Situational Factors**
 - businessModelingSkills: high
- **Pattern**
 - $o- \gg \ll design* \gg - \gg x$

Business Model Development Initialisation Pattern This pattern allows the flexible creation of a process for business model development starting at the development phase. Due to this flexibility, it should be used only by experts in business model development.

- **Type**
 - initialisation
- **Situational Factors**
 - businessModelingSkills: high
- **Pattern**
 - $o- \gg \ll develop* \gg - \gg x$

Business Model Validation Initialisation Pattern This pattern allows the flexible creation of a process for business model development starting at the validation phase. Due to this flexibility, it should be used only by experts in business model development.

- **Type**
 - initialisation
- **Situational Factors**
 - businessModelingSkills: high
- **Pattern**
 - $o- \gg \ll \text{validate*} \gg - \gg x$

Generic Parallelism Pattern The pattern allows the generic parallel creation of method building blocks.

- **Type**
 - generic
- **Situational Factors**
- **Pattern**
 - $o- \gg \text{AND} - \gg (\ll \text{generic*} \gg | \ll \text{generic*} \gg) - \gg x$

Generic Alternative Pattern The pattern allows the generic parallel creation of method building blocks.

- **Type**
 - generic
- **Situational Factors**
- **Pattern**
 - $o- \gg \text{OR}(\ll \text{generic*} \gg | \ll \text{generic*} \gg) - \gg x$

Generic Consecutive Pattern The pattern allows the consecutive creation of two method building blocks.

- **Type**
 - generic
- **Situational Factors**
- **Pattern**
 - $o- \gg \ll \text{generic*} \gg - \gg \ll \text{generic*} \gg - \gg x$

Intermediate Validation Pattern The pattern allows the intermediate validation of results during the discovery, design or validation stage.

- **Type**
 - generic
- **Situational Factors**
 - timeResources: medium
- **Pattern**
 - $o- \gg \ll \text{generic*} \gg - \gg \ll \text{validateIntermediate*} \gg + \gg x$

Customer First Discovery Pattern The pattern allows identifying the customers before targeting the problem.

- **Type**
 - discovery
- **Situational Factors**
 - problemValidity: medium
- **Pattern**
 - $o- > (<< customerDiscovery* >> - ><< problemDiscovery* >>)+ > x$

Problem First Discovery Pattern The pattern allows identifying the problem before targeting the customer.

- **Type**
 - discovery
- **Situational Factors**
 - customerValidity: medium
- **Pattern**
 - $o- > (<< problemDiscovery* >> - ><< customerDiscovery* >>)+ > x$

Customer Light Discovery Pattern The pattern allows the light discovery of the customers if the segment is already quite clear.

- **Type**
 - customerDiscovery
- **Situational Factors**
 - customerValidity: medium
 - timeResources: low
 - customerSegment: uniform
- **Pattern**
 - $o- ><< customerIdentification* >> - > x$

Customer Deep Discovery Pattern The pattern allows a deep analysis of the customer if the segment is quite unclear.

- **Type**
 - customerDiscovery
- **Situational Factors**
 - customerValidity: low
 - timeResources: medium
 - customerSegment: divers
- **Pattern**
 - $o- ><< customerIdentification* >> - ><< customerAnalysis >> - > x$

Problem Light Discovery Pattern The pattern allows the light discovery of the problem based on existing resources.

- **Type**
 - problemDiscovery
- **Situational Factors**
 - problemValidity: medium
 - timeResources: low
 - problemComplexity: low
- **Pattern**
 - $o- \gg \ll \textit{problemIdentification*} \gg - \gg x$

Problem Deep Discovery Pattern The pattern allows a deep discovery of the problem by generating new insights from the customer.

- **Type**
 - problemDiscovery
- **Situational Factors**
 - problemValidity: low
 - timeResources: medium
 - problemComplexity: medium
- **Pattern**
 - $o- \gg \ll \textit{problemIdentification} \gg - \gg \ll \textit{problemAnalysis*} \gg - \gg x$

Analysis Pattern The pattern allows the structuring of the analysis phase in the steps of the market analysis and the competitor analysis.

- **Type**
 - analysis
- **Situational Factors**
 - businessModelingSkills: low
 - marketSize: niche
- **Pattern**
 - $o- \gg \ll \textit{marketAnalysis*} \gg + \gg \ll \textit{competitorAnalysis*} \gg + \gg x$

Analysis Sharping Pattern The pattern allows the structuring of the analysis phase in the steps of the market analysis and the competitor analysis. Moreover, it allows a sharpening of the problem and the target group after both analyses.

- **Type**
 - analysis
- **Situational Factors**
 - businessModelingSkills: low
 - marketSize: mass
 - problemValidity: low
- **Pattern**
 - $o- \gg \ll \textit{marketAnalysis*} \gg + \gg \ll \textit{competitorAnalysis*} \gg + \gg \ll \textit{nicheAnalysis*} \gg + \gg x$

Design Pattern The pattern allows the simple design of a feature set and a corresponding business model for a mobile application. It should be used for the development of business models for simple apps with fewer uncertainties in the problem and the target group.

- **Type**
 - design
- **Situational Factors**
 - problemComplexity: medium
 - productComplexity: medium
- **Pattern**
 - $o- > AND- > (<< featureDesign* >> | << businessDesign* >>)- > x$

Design Enhancement Pattern The pattern allows the design of a feature set and a corresponding business model for a mobile application. It should be used for complex apps with uncertainties in the target group.

- **Type**
 - design
- **Situational Factors**
 - problemComplexity: high
 - productComplexity: high
- **Pattern**
 - $o- > AND- > (<< featureDesign* >> | << businessDesign* >>)- ><< enhancementDesign >> - > x$

Canvas Development Pattern The pattern allows the creation of a business model and a value proposition. It should be used by business developers who are familiar with canvas models.

- **Type**
 - businessDesign
- **Situational Factors**
 - businessModelingSkills: medium
- **Pattern**
 - $o- ><< vpDesign >> - ><< bmDesign >> - > x$

Strategy Identification Pattern The pattern allows the creation of a business model and a value proposition. It should be used by business developers who are not familiar with canvas models.

- **Type**
 - businessDesign
- **Situational Factors**
 - businessModelingSkills: medium
- **Pattern**
 - $o- ><< uspDesign >> - ><< monetizationDesign >> - ><< marketingDesign >> - > x$

Full Development Pattern The pattern allows the structured development of an app that covers all important aspects.

- **Type**
 - development
- **Situational Factors**
 - businessModelingSkills: low
 - productComplexity: medium
 - processSpeed: low
 - productFeatureValidity: low
- **Pattern**
 - $o- \gg \ll contentDevelopment* \gg - \gg \ll prototypeDevelopment* \gg - \gg \ll productDevelopment \gg - \gg x$

Content Development Pattern The pattern allows the development and spread of content to test the potential acceptance in the market.

- **Type**
 - contentDevelopment
- **Situational Factors**
 - productComplexity: medium
 - processSpeed: low
 - productFeatureValidity: low
- **Pattern**
 - $o- \gg \ll createContent* \gg - \gg \ll spreadContent* \gg - \gg x$

Marketing Development Pattern The pattern allows the parallel marketing of the app during the development phase. This ensures an existing brand in the market after the app has been developed.

- **Type**
 - marketingDevelopment
- **Situational Factors**
 - productComplexity: medium
 - processSpeed: medium
 - productValidity: medium
- **Pattern**
 - $o- \gg AND- \gg (\ll marketingDevelopment* \gg | \ll development* \gg) - \gg x$

Product Development Pattern The pattern allows the development of the final product for the store. It ensures the platform's selection, financing, development, and publishing in the store.

- **Type**
 - productDevelopment
- **Situational Factors**
 - productComplexity: medium
 - processSpeed: low
- **Pattern**
 - $o- \gg \ll platformSelection \gg - \gg \ll financialCheck* \gg - \gg \ll productDevelopment* \gg - \gg \ll platformPublishing \gg - \gg x$

References

1. App Annie Inc: The State of Mobile 2021, <https://www.appannie.com/en/go/state-of-mobile-2021/>
2. Chesbrough, H.: Business model innovation: it's not just about technology anymore. *Strategy & Leadership* **35**(6), 12–17 (2007)
3. Garousi, V., Felderer, M., Mäntylä, M.V.: Guidelines for including grey literature and conducting multivocal literature reviews in software engineering. *Information and Software Technology* **106**, 101–121 (2019)
4. General Electric Inc: GE Global Innovation Barometer 2018, <https://www.ge.com/reports/innovation-barometer-2018/>
5. Gottschalk, S., Yigitbas, E., Nowosad, A., Engels, G.: Situation-specific Business Model Development Methods for Mobile App Developers. In: *Enterprise, Business-Process and Information Systems Modeling*. Springer (2021)
6. Henderson-Sellers, B., Ralyté, J., Ågerfalk, P.J., Rossi, M.: *Situational Method Engineering*. Springer Berlin Heidelberg, Berlin, Heidelberg (2014)
7. Kitchenham, B., Brereton, P.: A systematic review of systematic review process research in software engineering. *Information and Software Technology* **55**(12), 2049–2075 (2013)
8. Osterwalder, A., Pigneur, Y.: *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers*. John Wiley & Sons, Hoboken (2010)
9. Teece, D.J.: Business Models, Business Strategy and Innovation. *Long Range Planning* **43**(2-3), 172–194 (2010)

Appendix D List of Analyzed Websites

In this appendix, we list the website which we have discovered for the method base. The initial list access was on 19th January 2021. The appendix consists of the Table 3 and 4 with each 25 websites.

Table 3. First Discovered Websites of our Literature Review

Identifier	Website
W1	https://uptech.team/blog/validate-app-idea-without-development
W2	https://designli.co/blog/is-my-app-idea-any-good-x-steps-to-validate-your-app-idea/
W3	https://www.apptamin.com/blog/how-to-validate-your-app-ideas/
W4	https://www.forbes.com/sites/abdoriani/2019/10/12/the-simplest-way-to-validate-a-startup-app-idea/
W5	https://mindsea.com/validate-your-mobile-app-idea/
W6	https://appinventiv.com/blog/how-to-validate-your-app-idea/
W7	https://articles.bplans.com/how-and-why-you-should-validate-your-app-idea-before-you-build/
W8	https://www.nodesagency.com/guide-how-you-develop-app-idea/
W9	https://enterprisemonkey.com.au/blog/5-ways-to-validate-your-app-idea-launch-quickly/
W10	https://www.businessnewsdaily.com/6540-how-to-test-your-business-idea.html
W11	https://dzone.com/articles/10-key-steps-to-turn-your-mobile-app-idea-into-rea
W12	https://www.entrepreneur.com/article/228328
W13	https://abdoriani.com/app-idea/
W14	https://www.softermii.com/blog/how-to-validate-your-app-idea-and-build-a-successful-solution
W15	https://enterprisemonkey.com.au/blog/5-ways-to-validate-your-app-idea-launch-quickly/
W16	https://buildfire.com/turn-your-app-idea-into-reality/
W17	https://yfsmagazine.com/2019/03/07/6-simple-ways-to-validate-your-mobile-app-idea/
W18	https://www.entrepreneur.com/article/230050
W19	https://themindstudios.com/blog/how-to-validate-your-app-idea/
W20	https://medium.theuxblog.com/how-to-validate-your-app-ideas-e3f38753af54
W21	https://www.businessofapps.com/insights/how-to-validate-your-mobile-app-idea-with-ab-testing/
W22	http://apptology.com/blog/3-steps-to-develop-mobile-app-idea/
W23	https://www.youtube.com/watch?v=p6yFRmhlQNO
W24	https://blog.railwaymen.org/how-to-validate-your-app-idea-in-5-simple-steps
W25	https://www.apptunix.com/blog/how-to-validate-an-app-idea/

Table 4. Second Discovered Websites of our Literature Review

Identifier	Website
W26	https://www.appdisciple.com/7-effective-strategies-validate-app-idea-weekend/
W27	https://www.mindinventory.com/blog/how-to-validate-your-mobile-app-idea/
W28	https://www.cumulations.com/blogs/117/validate-app-idea
W29	https://www.incomediary.com/how-to-validate-your-million-app-idea-in-3-simple-steps/
W30	https://appmasters.com/3-simple-ways-to-validate-an-app-idea/
W31	https://www.peerbits.com/blog/worldclass-mobile-app-ideas.html
W32	https://www.quora.com/How-can-I-test-a-new-mobile-app-idea-in-the-market
W33	https://reinvently.com/blog/how-to-validate-app-idea-save-it-from-failure/
W34	https://www.designrush.com/trends/how-to-come-up-with-a-new-app-idea
W35	https://newlionlabs.com/de-risk-venture-validate-app-idea-break-bank/
W36	https://www.intelegain.com/app-ideas-for-startups-to-launch-in-2020/
W37	https://apiko.com/blog/how-to-validate-the-idea-and-features-of-your-application-before-development/
W38	https://appfigures.com/resources/guides/app-pre-launch-research
W39	https://designforfounders.com/app-idea/
W40	https://kodytechnolab.com/app-idea-validation
W41	https://www.bandofcoders.com/5-ways-test-app-idea/
W42	https://fugenxmobileappdevelopment.medium.com/effective-strategies-to-validate-your-mobile-app-idea-b03be0228c06
W43	https://www.spaceotechnologies.com/new-mobile-app-ideas-to-make-money/
W44	http://www.getmyappz.com/blog/validate-your-mobile-app-idea/
W45	https://fueled.com/blog/successful-app-idea/
W46	https://www.reddit.com/r/Entrepreneur/comments/4b4o1p/why_you_need_to_validate_your_mobile_app_idea/
W47	https://www.ryrob.com/validate-business-idea/
W48	https://www.alphasoftware.com/blog/how-to-convert-your-ideas-into-a-mobile-app
W49	https://www.ksolves.com/blog/mobile-app-development/simplest-ways-to-validate-an-app-idea
W50	https://www.appypie.com/how-to-validate-your-app-idea