# Errol: A virtual coach for question asking and enabling learning by reflection in startup engineering

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**Abstract**

The Socratic method of teaching engages learners in extended conversations and encourages learning through answering questions, making arguments, and reflecting on the evolving conversation. This method can be a powerful instrument of learning by reflection, especially in domains in which the right answers to open questions are not known in advance such as entrepreneurship. In this paper, we describe an initial experiment in developing AI technology for simulating the Socratic method of teaching in learning about entrepreneurship. When a would-be entrepreneurs creates a business model on the Business Model Canvas (BMC), the AI agent named Errol uses semantic and lexical analysis of the entries on the BMC to ask questions of the students. By attempting to categorize and correct the errors that novices typically make, Errol seeks to accelerate the process by which a novice can start creating more expert-like business models.

# Errol: A virtual coach for question asking and enabling learning by reflection in startup engineering

## Section 1. Introduction

With the widespread adoption of the Internet, it has never been easier for entrepreneurs to find people interested in buying their products and services. The Internet has opened the doors to business ownership to almost any enthusiastic entrepreneur. Websites like Amazon, eBay, Etsy, and Craigslist offer creators a platform through which they can find a market for and eventually sell their work. However, despite the increased access to distribution networks, this configuration is biased towards those who can quickly adapt to the environment over those who may take more time to learn. The ability for an aspiring business owner to receive formal business training has not yet caught up to the modern day. Much of this knowledge still requires additional years of education. This barrier of access to learning about startup engineering seems to set many new businesses up to failure.

To surpass this obstacle, education in startup engineering needs to be made available on a wider scale. To this end, Osterwalder & Pigneur (2010) developed the Business Model Canvas (or BMC). With BMC, would-be entrepreneurs were afforded the opportunity to articulate and examine the value their potential business added to the general market, the customer segments it targeted, and many other components necessary to kickstart their ideas. Yet developing a good business model using BMC also requires getting thorough and specialized feedback on what is good and what can be improved. Thus, the National Science Foundation's Innovation Corps (I-Corps) program, and startup bootcamps and incubators such as Y Combinator, and AngelPad are dedicated towards having human coaches provide iterative feedback on a startup team's BMC, hopefully enabling the would-be entrepreneurs to provide the right products and services to the right customer markets that can optimize their potential for success.

However, a problem currently faced by many startup incubators and human coaches, as well as startup founders, is limited time available to critique a BMC and to convey feedback. This creates a need for AI teaching assistants. Fortunately, the early stages of developing a business model follow a repetitive pattern for most would-be entrepreneurs. From the perspective of potential founders of startups, they typically do not have on-demand access to a human coach who could give them critical feedback on their business models, allowing for faster improvements on their business modeling and customer growth. From the perspective of human coaches, many novice entrepreneurs face the same issues in business growth and customer adoption, necessitating them to give the same types of feedback to startup after startup, year after year. This creates an opportunity for developing a new kind of AI coach for addressing the problem. Hence this project on a virtual coach we call Errol.

## Section 2. The Business Model Canvas

A BMC is a modeling template which simplifies the description of a business as a whole into nine sections: Customer Segments, Value Propositions, Customer Relationships, Channels, Key Activities, Key Resources, Key Partners, Cost Structure, and Revenue Streams. Figure 1 provides a snapshot of an evolving business model using BMC.

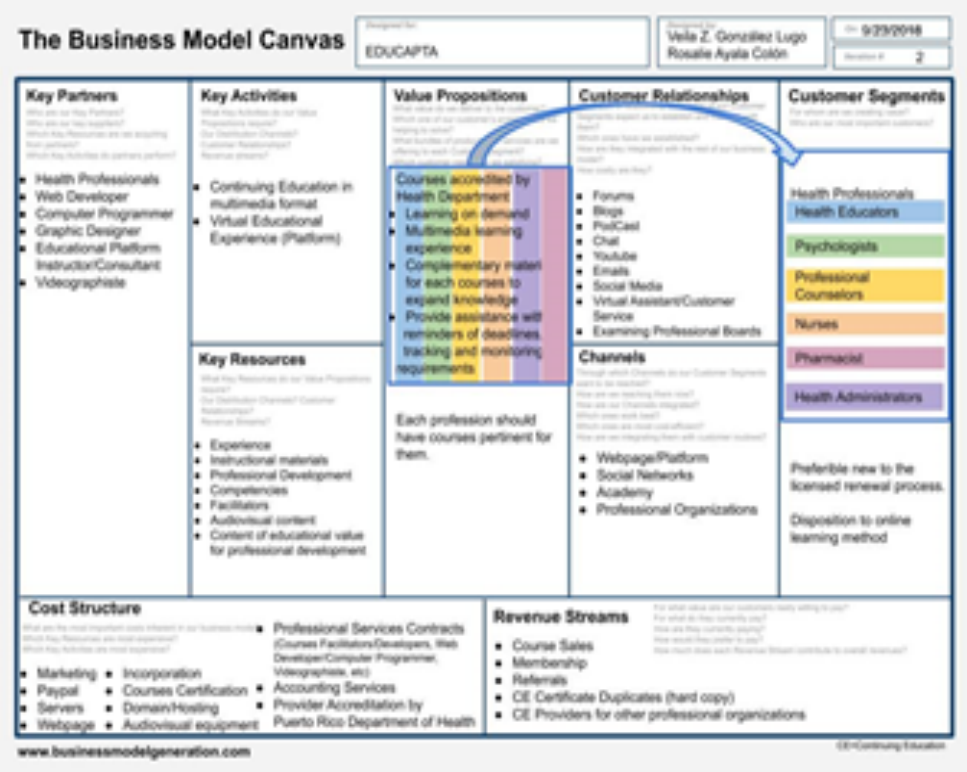


***Figure 1: The business model of an entrepreneurial team that is creating a product for the continued education of healthcare professionals.***

## Section 3. Errol: A virtual teaching assistant for question asking

While all nine elements of a BMC are relevant to any business, we scoped our preliminary version of Errol to focus on the most important sections and the relationships between them: Value Propositions and Customer Segments. These two sections are the drivers of what goes in the rest of a BMC. Customer Segments are the section of the BMC that address which customers will be served by the business while Value Propositions talk about what value the business will add to enrich the lives of customers; these will be abbreviated as CS and VP respectively for the rest of the paper.

In order to explore this problem with real data, we decided to pursue a specific batch of one incubator in particular: the NSF's Innovation Corps Puerto Rico unit from 2018. From the sample BMCs we were provided by the I-Corps program, we observed that the startup coaches were trying to figure out the

general contents of the business model as represented on the BMC, as well as what the various segments on the BMCs were lacking in content, structure or relationships. They were trying to identify the errors in the business model that novice learners of startup engineering typically make. We can think of Errol as an AI agent that seeks to simulate some of the behaviors of the human coaches by similarly trying to identify errors in the business models of novice learners and asking questions to help the learners address the errors.

Our goal in the Errol project is not to mimic the human coach in every respect, but to simulate the experience of a coach reviewing a business model represented on a BMC and giving directed feedback by asking questions. Our focus has been on providing guidance that novice learners of startup engineering may find useful in improving their business model. While Errol does not ask exactly the same questions as a human coach, it tries to address typical errors in business model generation that an expert may also consider when critiquing a business model.
Errol seeks to simulate the experience of receiving expert guidance on a business model by taking as input a business model on BMC, parsing the CS and VP sections, and asking the model creator questions that either ask the learner to modify what it already has or to suggest ways to make the model richer in its ability to project the business idea and plan. As a learning tool for aspiring entrepreneurs, Errol would hold the role of a coach, utilizing a method attributed to one of the earliest known teachers: Socrates.

## Section 4. Errol's Architecture

In this section, we present Errol's information-processing architecture and each component in the architecture.

### 4.a. Information Processing in Errol

Figure 2 illustrates the flow of information in Errol. The entries in the BMC on the left of the figure are read, analyzed for part of speech, and inputted into both a lexical analyzer and a semantic analyzer. Both the lexical analyzer and the semantic analyzer generate questions that are combined and sent to the user on the right of Figure 2.

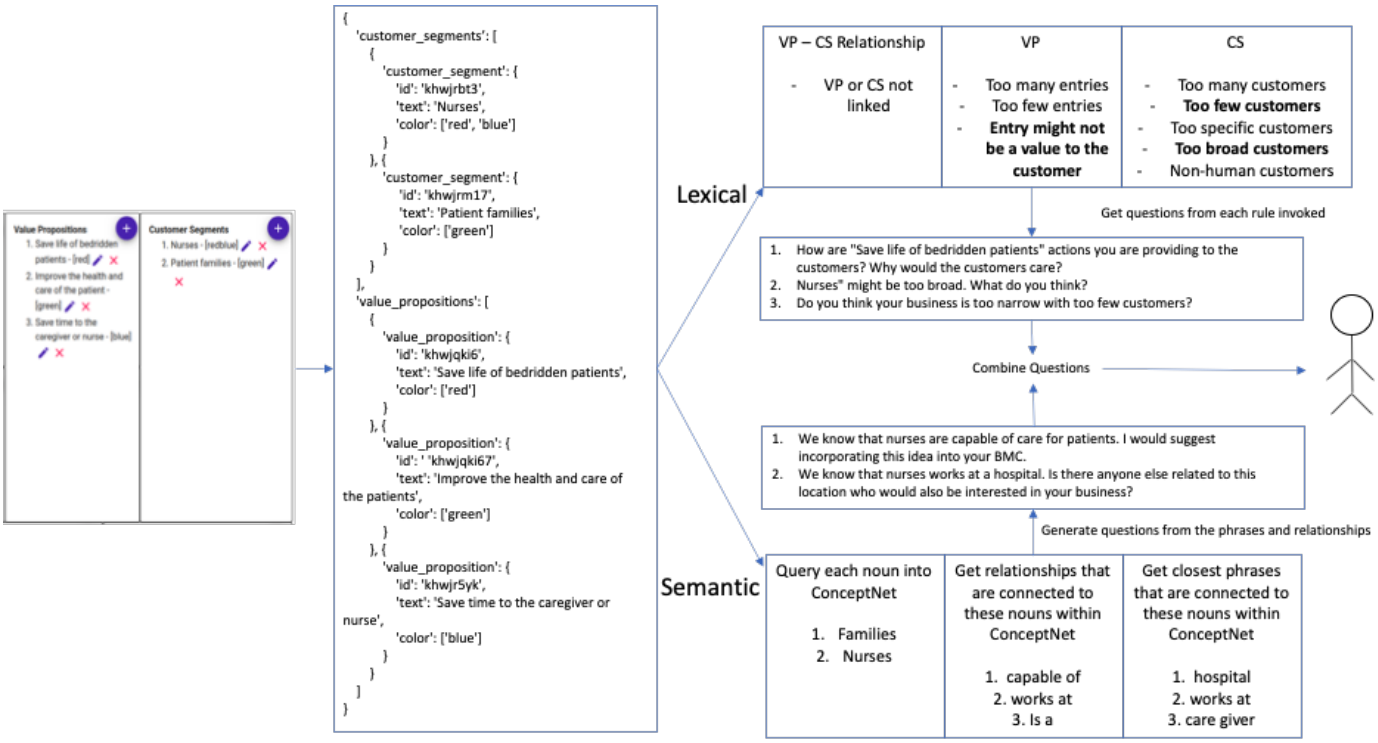


***Figure 2: A graphical representation of the process that Errol uses to output questions.***

### 4.b. Errol's User Interface

As Figure 3 illustrates, the user interface to Errol consists of a representation of the BMC. The user can directly make entries in Errol's BMC.

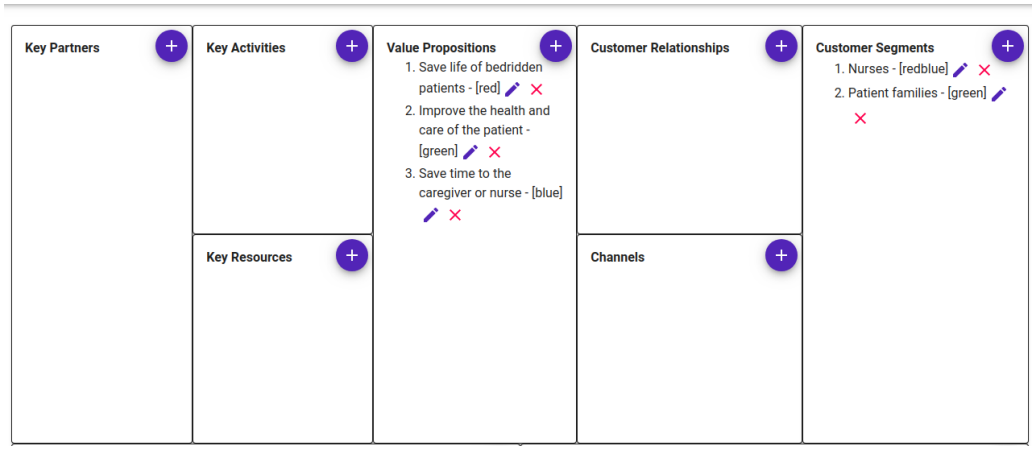


***Figure 3: The User Interface to Errol.***

### 4.c. Input Parsing in Errol

Errol uses NLTK (https://www.nltk.org/) for preliminary processing of the input, namely, the entries under Value Propositions and Customer Segments in the BMC. In particular, as Table summarizes, Errol uses NLTK's part of speech (POS) tagging component to parse out the nouns from the user's input.

**Table 1: Preliminary processing in Errol.**

| Customer Segments | Value Propositions | Text | Rule | Lexical/Semantic (L/S) |
|---|---|---|---|---|
| ["Nurses, "Patient families"] | - | "Do you think your business is too narrow with too few customers?" | "modunder" | L |
| ["Nurses", "Patient families"] | - | 'I think you might benefit from focusing on a more targeted customer base than "Nurses". What do you think? | "toobroad_mod" | L |
| ["Nurses", "Patient families"] | | 'Can you say anything more about "Nurses"?' | "tooshort_mod" | L |
| ["Nurses", "Patient families"] | - | 'Do you think could target more people than "Nurses"?' | 'toospecific_mod' | L |
| - | - | 'We know that nurses are capable of care for patients. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' | S |
| - | - | 'We know that nurses works at a hospital. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' | S |
| - | - | 'We know that nurses are at location hospital. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' | S |

### 4.d. ConceptNet as Errol's Knowledge Base

Errol uses ConceptNet (https://conceptnet.io/) as its knowledge base. ConceptNet is an open-source knowledge base that contains information on many everyday terms and represents them as concepts that

are related to other concepts. For example, one of the ways a person may describe a doctor is as “someone who works at a hospital”. ConceptNet encodes this information as “doctor atLocation hospital”, where “atLocation” is one of many relationships that may result from searching for “doctor”; others include “capableOf” and “usedFor”, the latter of which says why you may go to a doctor. In addition to existing as a searchable webportal, ConceptNet also provides an API; Errol connects to ConceptNet through this API.

The business model on the input BMC may refer to any of the concept-relation pairs in ConceptNet. Thus, we encode each concept-relation pair in Errol as a question. These questions are the “secret sauce” that makes Errol work. Errol takes each noun found in the original BMC and sends an API call to ConceptNet. The JSON that is returned gives us all the relation-concept pairs with which we can generate a question.

### 4.e. Natural Language Analysis

In order to determine what questions to ask, Errol performs lexical and semantic analysis as illustrated in Figure 2.

#### 4.e.(i) Lexical Analysis

Here is a high-level process for lexical analysis:

1. Receive a JSON object from the frontend that defines all the inputs and connections between BMC entries
2. Parse inputs and tag each word with part-of-speech using NLTK's POS tagging component
3. For each rule from the architecture:
    a. Parse the inputs and tags.
    b. If a rule is triggered (e.g. too many words in one VP input):
        i. Pick a question from the template that corresponds to this rule
4. Compile a master JSON with all the lexical questions generated from 3
5. Move on to the semantic analysis detailed below

As one can see from the above pseudocode, the lexical system has a list of questions that were manually written and associated with specific “triggers”. In order to try and make the dialogue between the user and Errol seem a little more natural, each trigger had several questions associated with it, where each question asked the same thing but in several different ways. This way, the user would not necessarily get back the same exact question on every iteration, but the questions would revolve around the same topic from iteration to iteration if necessary.

#### 4.e.(ii) Semantic Analysis

Here is the high-level process for the semantic analysis:

1. Parse out each input statement for all the nouns contained in that statement.
2. For each noun:

a. Query ConceptNet for each noun (for example, if "doctors" was in the input, we make a call to ConceptNet for information on the concept "doctor").
b. Determine the categories ConceptNet has on the concept. In the case of "doctor", a couple such examples would be "capableOf" and "atLocation".
    i. For each of these categories, generate a question based off of a template with the appropriate values plugged in.
c. Prune any duplicate questions that have been generated

3. Update the JSON object to include the semantic questions alongside the lexical questions

**Section 5. Experimental Results**

In this section, we briefly present the results of preliminary experiments with Errol.

**5.a. Analysis of BMC 701, 704, 705, 706, 707, 708, 709 and 710**

BMC 701, 704, 705, 706, 707, 708, 709, and 710 formed one set of case studies from the NSF I-Corps cohort in Puerto Rico in 2018. We ran Errol on all of them. To give a sense of Errol's performance, Appendix A illustrates the contents of each of these BMC, describes Errol's processing of each, and summarizes Errol's performance.

**5.b. Analysis of BMC 713, 714, 715, and 716**

BMC 713, 714, 715, and 716 were another set of case studies from the NSF I-Corps cohort in Puerto Rico in 2018. We ran Errol on this set as well. Appendix B illustrates the contents of each of these BMC and describes Errol's questions for each.

**Section 6. Comparison of Errol's Question Asking with Human Coaches**

For BMC 708 and 709, we had access to data on the questions that human coaches had asked at the NSF I-Corps cohort in Puerto Rico in 2018. We ran Errol on these two BMC and compared its questions with that of the human coaches. Below is a summary of the comparison:

a. <u>Human Coaches:</u>
    i. In-depth and thought-provoking questions that induce reflection
    ii. Challenging the usefulness of the input as it relates to the business model
    iii. Asking for more detail only where things are vague that would help the reviewer/reader understand what the intention of the BMC modeler was
    iv. Encourages cutting back some things to focus on biggest priorities
    v. Challenging:
        1. Underlying assumptions & motivations
        2. Word choice
        3. Quantifiers
    vi. Questions are all backed by a strong underlying understanding of the business

b. <u>Errol:</u>
    i. Errol's semantic analysis seems to be emphasizing questions that prompts the user to expand on ideas.
    ii. More hollow "templated" questions that do ask the basic questions ("who, what,

where , when, why, how"), but are not very specific in the understanding of the BMC as a whole
iii. Can output contradictory questions for the same BMC
iv. Often asks user to expand on ideas where the expert would encourage to cut down and refine/clean ideas
v. Gives too many "should" recommendations rather than asking questions (not all recommendations are good)
vi. Lexical-based type questions are most similar to expert reviewer questions that challenge quantify, BMC mappings, features vs values

**Section 7. Related Work**

Below we briefly discuss research that has directly influenced the Errol project. Graesser, Conley & Olney (2012) and VanLehn (2011) presently two overviews of research on AI in education in general and intelligent tutoring systems in particular. Errol too represents AI research on education and can be viewed as an intelligent tutoring system. However, unlike many intelligent tutoring systems that address well-defined closed-world problems with a single correct answer in K-12 education, Errol addresses an ill-defined, open-ended problem with no single correct answer known in advance for training in entrepreneurship.

Schank & Cleary's (1995) *Engines for Education* provides a theoretical framework for addressing learning in ill-defined, open-ended domains. They proposed using AI agents as a "Sounding Board" for human learners. The key to addressing an open-ended problem is to ask the right questions. The student likely will know more about the given problem than his or her AI tutor. Thus, the learner should maintain control and that the AI tutor should only supply the student with questions that it believes are appropriate to pursue. The AI might not know much about the problem at hand; all it knows are what types of questions are useful to ask and how to present the questions in a sensible order. A passive learner may choose to follow the path suggested by the AI agent, but a more active learner may choose to change the course of questioning. We can view Errol as a sounding board for novice learners of startup engineering.

Kearsley (1976) and Nielson et al. provide an early and a recent taxonomy of questions, respectively. Graessar's reflections on his AutoTutor suggest that what questions an AI agent asks is more important than how it asks them. Errol takes a similar stance.

Errol makes extensive use of ConceptNet (Speer, Chin & Havasi 2017) that grew out of long-standing efforts to capture commonsense knowledge for interactive applications (Minsky 2004; Lieberman, Liu, Singh & Barry 2004). It is designed to represent general knowledge involved in understanding language and it allows applications to better understand meanings behind words. The knowledge graph consists of nodes that represent phrases and weighted edges that represent relations between two nodes. Entries in the knowledge graph include pointers to/from many external knowledge bases such as OpenCyc and

WordNet. ConceptNet helps Errol understand a learner's input as it represents the relationships between the phrases. It can also allow Errol to advise on future directions by traversing other edges in the knowledge graph the student might not have explored.

In some ways Errol is opposite of Jill Watson (Goel & Polepeddi 2018), the first virtual teaching assistant. Jill answered learner's questions; Errol asks questions of learners. Jill's replied to very specific questions with precise answers; Errol asks questions in response to ill-defined, vague and evolving business models on a BMC. In some ways, Errol is more like our virtual research assistant VERA (An et al. 2020) than Jill Watson. VERA is an interactive open learning environment for inquiry-based modeling; it helps a learner construct conceptual models of natural phenomena, evaluate the models by simulation, and revise the conceptual and simulation models as needed. In VERA, a learner learns by doing and by reflection. Errol too is an interactive open learning environment for inquiry-based research, and it too helps a learner by doing and by reflection.

**Section 8. Discussion**

To our knowledge, Errol is the first AI tutor that operates as a Socratic question-asking agent in the domain of startup engineering. Of course, Errol has several limitations compared to human coaches as indicated in Section 6. In this section, we briefly critique three aspects of Errol's information processing that also indicate directions for further work in the near future: a heavy reliance on NLTK's POS tagging component, the semantic analyzer's focus on nouns, and the lack of truly iterative question generation.

Errol's current architecture focuses heavily on the POS tagging component from the NLTK library. The lexical analyzer parses through the POS tags to return questions that the learner would need to reflect on to modify their entries in BMCs. Hence, the accuracy of the questions returned from lexical analysis is heavily reliant on the accuracy of the POS tags. The semantic analyzer also uses the subjects and nouns from the POS tags to query ConceptNet and search relevant terms and relationships. Given that many learners do not write grammatically correct phrases or sentences, accuracy of the POS tags can be somewhat doubtful. Improving the accuracy of the POS tags can be difficult as NLTK is an external library. Thus, it would be useful to develop a method to accurately parse BMCs with grammatically incorrect sentences .

Secondly, while it is useful for the semantic analyzer to start with focusing on nouns, a truly robust question generation system needs to be able to understand every input statement in its entirety. The focus on nouns allowed the Errol project to develop initial algorithms for question generation, but often times, other parts of speech can influence what questions get asked. For example, there may be a difference between asking questions about "small profit margins" versus "large profit margins". Thus, it may be

prudent for future iterations of Errol to incorporate techniques like verb and adjective recognition to better enhance the set of questions that are sent to the learner.

We characterize truly iterative question generation as a technique where the previous set of questions that Errol asks will influence the future set of questions. In a truly iterative system, if Errol asked the same question several times, it may choose to either prioritize that question the next time or ask fewer questions in total to make that question stand out. The lack of this makes it difficult for the user to see if they are making progress and so future iterations of Errol will require the incorporation of truly iterative question generation.

## IX. Conclusions

Errol is a virtual coach for simulating the experience of receiving feedback from a human coach on business models developed by novice learners of entrepreneurship. Would-be entrepreneurs tend to make the same mistakes in early stages of developing their business models. Human coaches ask questions to help the learners reflect on their mistakes and improve the business models. Errol similarly makes use of typical errors in developing business models to ask questions about a given business model and help the learner learn by reflection on the feedback. Errol uses both lexical and semantic analysis to generate questions. In this way, Errol acts like a sounding board for the would-be entrepreneur. Our next step is to introduce Errol in a class on Startup Engineering and assess students' use of the virtual coach.

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**Appendix A:**

**A.1. BMC 701**

Figure 4 illustrates the contents of BMC 701 input to Errol and Table 2 summarizes its processing.

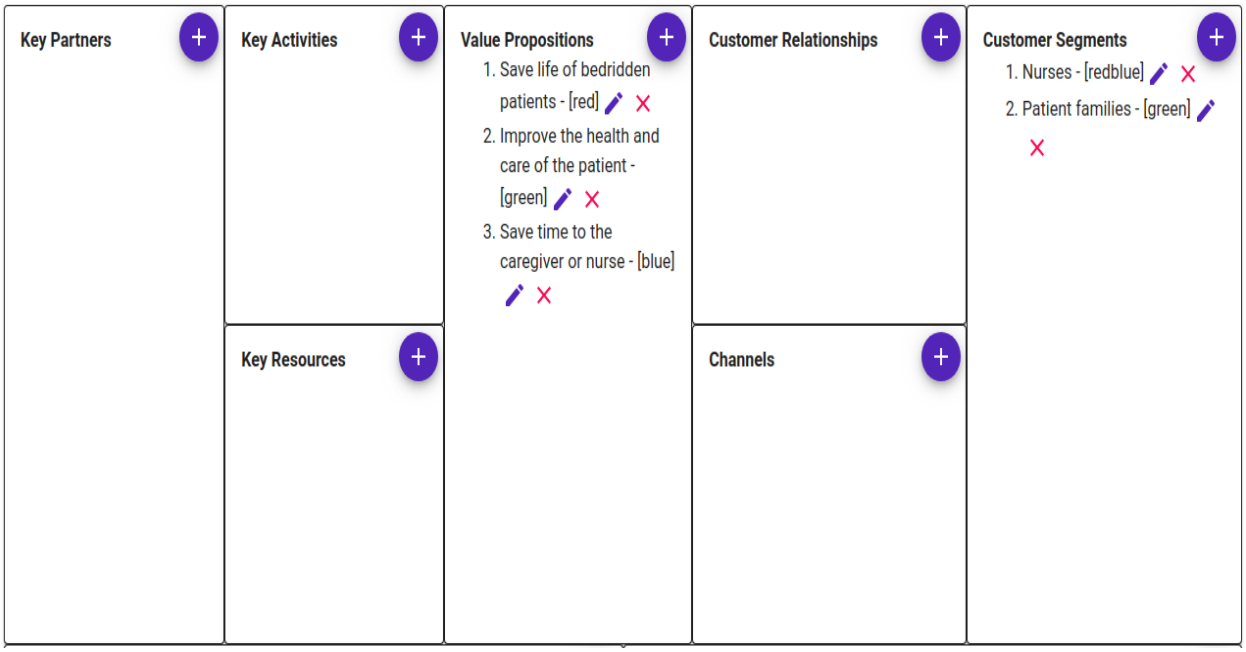


***Figure 4: Contents of BMC 701.***

**Table 2: Errol's processing on BMC 701**

| Customer Segments | Value Propositions | Text | Rule |
|---|---|---|---|
| ['Nurses', 'Patient families'] | - | "Do you think your business is too narrow with too few customers?" | 'modunder' |
| ['Nurses', 'Patient families'] | - | 'I think you might benefit from focusing on a more targeted customer base than "Nurses". What do you think? | 'toobroad_mod' |
| ['Nurses', 'Patient families'] | - | 'Can you say anything more about "Nurses"?' | 'tooshort_mod' |
| ['Nurses', 'Patient families'] | - | 'Do you think could target more people than "Nurses"?' | 'toospecific_mod' |
| - | - | 'We know that nurses are capable of care for patients. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that nurses works at a hospital. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that nurses are at location hospital. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that nurses is a care givers. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that families are at location park. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that families works at a park. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | We know that families works at a supermarket. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that families has a same last name. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that families are capable of plan trips. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |

| | | | |
|---|---|---|---|
| - | ['Save time to the caregiver or nurse'] | 'Who cares about "Save time to the caregiver or nurse"?' | 'missingLink' |
| - | - | 'Do you think that there are enough customers to receive these values?' | 'csVPRatio' |

**Summary of Errol's performance on BMC 701:**

1. 15 total questions
2. Rule breakdown (semantic):
    a. 6 by the "catch-all" rule
    b. 3 "location" questions
3. Rule breakdown (lexical):
    a. 1 "modunder" question
    b. 1 "too_broad" question
    c. 1 "too_specific" question
    d. 1 "too_short" question
    e. 1 "csVPRatio" question
    f. 1 "missingLink" question

### A.2. BMC 704

Figure 5 illustrates the contents of BMC 704 input to Errol and Table 3 summarizes its processing.

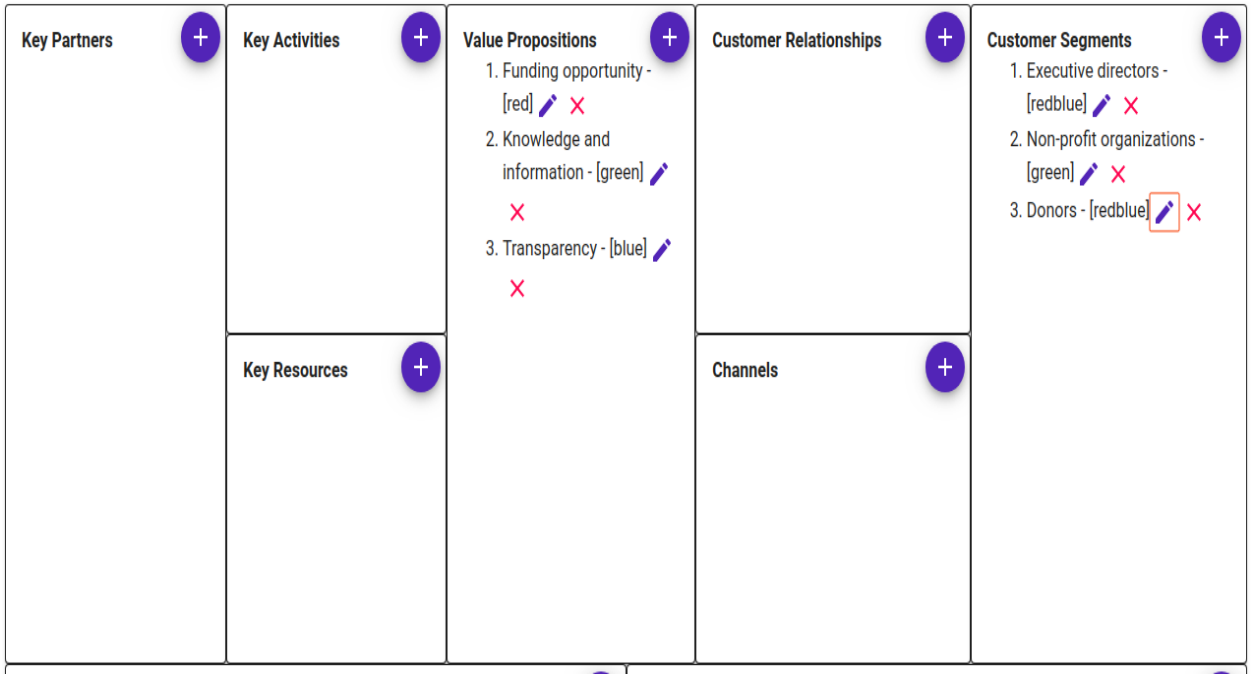


*Figure 5: Contents of BMC 704 .*

**Table 3: Errol's processing on BMC 704.**

| Customer Segments | Value Propositions | Text | Rule |
|---|---|---|---|
| ['Executive directors', 'Non-profit organizations', 'Donors'] | - | 'Do you think you could narrow down "Executive directors"?' | 'toobroad_mod' |
| ['Executive directors', 'Non-profit organizations', 'Donors'] | - | 'Could you please expand on "Executive directors" for me?' | 'tooshort_mod' |
| ['Executive directors', 'Non-profit organizations', 'Donors'] | - | 'Overall, it seems like "Executive directors" might be too specific. What do you think?' | 'toospecific_mod' |
| ['Non-profit organizations'] | - | 'Could you please expand on these shorthands in "Non-profit organizations" for me?' | 'shorthands_mod' |
| - | [['Funding opportunity', 'Knowledge and information', 'Transparency']] | 'Why would your customers care about "Funding opportunity"?' | 'noactions_mod' |
| - | [['Funding opportunity', 'Transparency']] | 'Anything more you could say about "Funding opportunity"?' | 'tooshort_mod' |
| - | - | 'We know that executive is a person. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that executive derived from n. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that directors are capable of direct movie. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that directors has a many decisions to make. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that organizations are capable of bus people. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that organizations has a members. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |

| | | | |
|---|---|---|---|
| - | - | 'We know that donors are capable of gift mney to charity. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | ['Transparency'] | 'Who benefits from  "Transparency"?' | 'missingLink' |

**Summary of Errol's performance on BMC 704**

1. 14 total questions
2. Rule breakdown (semantic):
    (1) 7 by the "catch-all" rule
3. Rule breakdown (lexical):
    (1) 1 "too_broad" question
    (2) 1 "too_specific" question
    (3) 2 "too_short" questions
    (4) 1 "shorthands_mod" question
    (5) 1 "no_actions" question
    (6) 1 "missingLink" question

## A.3. BMC 705

Figure 6 illustrates the contents of BMC 704 input to Errol and Table 4 summarizes its processing.

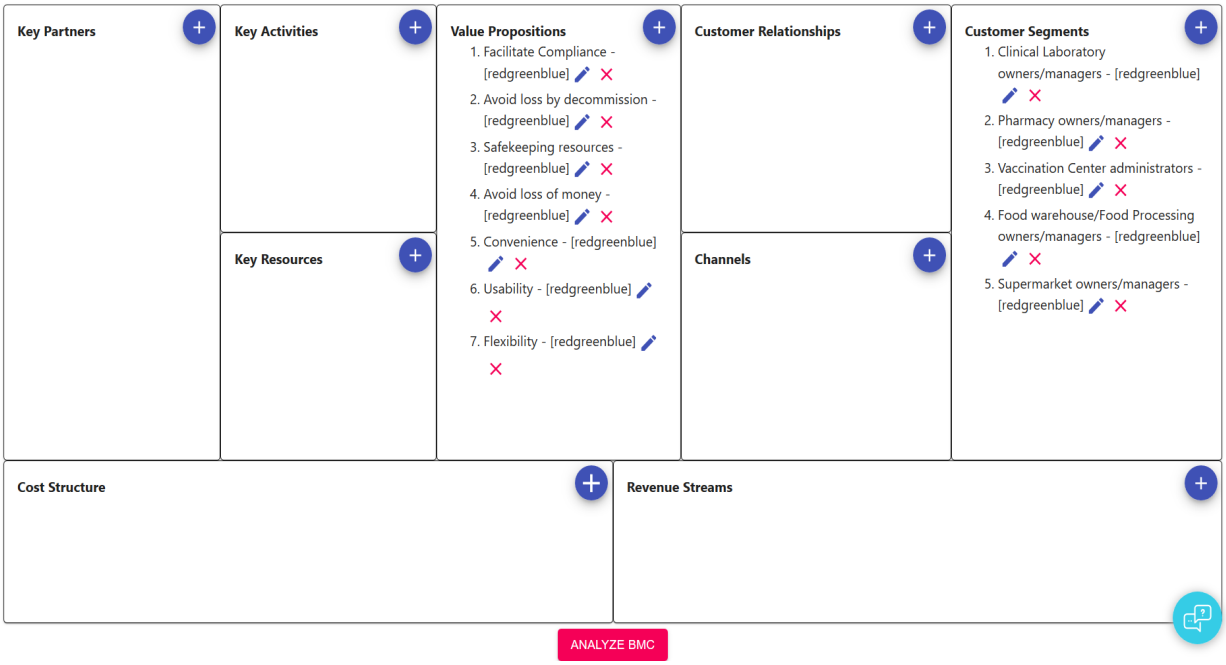


***Figure 6: Contents of BMC 705 as would be seen by an Errol user.***

**Table 4: Errol's processing on BMC 705.**

| Customer Segments | Value Propositions | Text | Rule |
|---|---|---|---|
| ['Clinical Laboratory owners/managers', 'Pharmacy owners/managers', 'Vaccination Center administrators', 'Food warehouse/Food Processing owners/managers', 'Supermarket owners/managers'] | - | 'How could you narrow your customer segments "Clinical Laboratory owners/managers"?' | 'toobroad_mod' |
| ['Clinical Laboratory owners/managers', 'Pharmacy owners/managers', 'Vaccination Center administrators', 'Food warehouse/Food Processing owners/managers', 'Supermarket owners/managers'] | - | 'You are being too specific with "Clinical Laboratory owners/managers". Do you think you might be able to provide value to more people?' | 'toospecific_mod' |
| ['Clinical Laboratory owners/managers', 'Pharmacy owners/managers', 'Food warehouse/Food Processing owners/managers', 'Supermarket owners/managers'] | - | 'Could you please expand on these shorthands in "Clinical Laboratory owners/managers" for me?' | 'shorthands_mod' |
| - | [['Facilitate Compliance', 'Safekeeping resources', 'Convenience', 'Usability', 'Flexibility']] | 'What more can you say about "Facilitate Compliance"?' | 'tooshort_mod' |
| - | - | 'We know that pharmacy is a cognition. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that vaccination is related to inoculation. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | We know that vaccination is a state. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that center is related to middle. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that center is an artifact. I would suggest incorporating this idea into | 'csQuestionAskerRule' |

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| | | your BMC.' | |
| - | - | 'We know that food works at a refrigerator. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that food is at location refrigerator. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that food works at a table. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that food works at a kitchen. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that food receives action eaten. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that food works at a oven. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that supermarket is at location city. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that supermarket works at a city. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that supermarket used for shopping. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'Do you think that there are enough customers to receive these values?' | 'csVPRatio' |

**Summary of Errol's performance on BMC 705:**

1. 19 total questions
2. Rule breakdown (semantic):
    a. 9 by the "catch-all" rule
    b. 5 "location" questions
3. Rule breakdown (lexical):
    a. 1 "too_broad" question
    b. 1 "too_specific" question
    c. 1 "shorthands" question
    d. 1 "too_short" question
    e. 1 "csVPRatio" question

### A.4. BMC 706

Figure 7 illustrates the contents of BMC 706 input to Errol and Table 5 summarizes its processing.

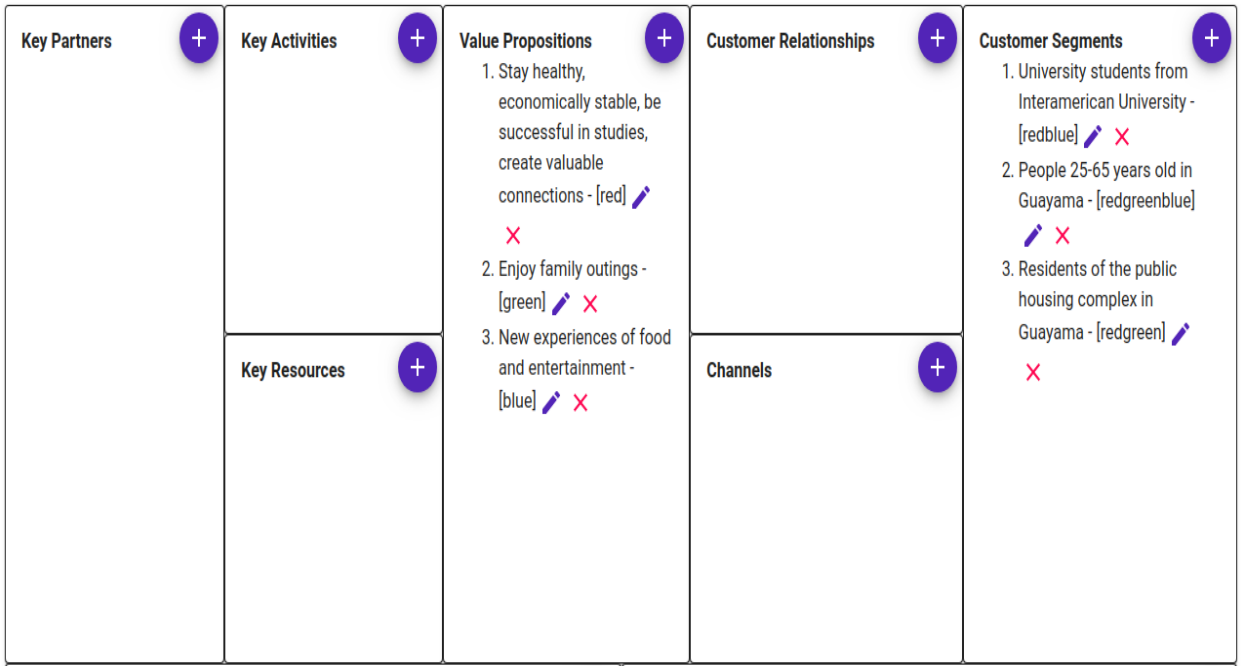


***Figure 7: Contents of BMC 706.***

**Table 5. Errol's processing on BMC 706.**

| Customer Segments | Value Propositions | Text | Rule |
|---|---|---|---|
| ['University students from Interamerican University', 'People 25-65 years old in Guayama ', 'Residents of the public housing complex in Guayama'] | - | 'Do you think you could narrow down "University students from Interamerican University"?' | 'toobroad_mod' |
| ['University students from Interamerican University', 'People 25-65 years old in Guayama ', 'Residents of the public housing complex in Guayama'] | - | 'Do you think "University students from Interamerican University" may be too specific?' | 'toospecific_mod' |
| ['University students from Interamerican University', 'People 25-65 years old in Guayama ', 'Residents of the public housing complex in Guayama'] | - | 'Can you elaborate the shorthands in "University students from Interamerican University"?' | 'shorthands_mod' |
| - | [['Stay healthy, economically stable, be successful in studies, create valuable connections ']] | 'Can you expand on these shorthands in "Stay healthy, economically stable, be successful in studies, create valuable connections "?' | 'shorthands_mod' |
| - | - | 'We know that university is a place. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that students are at location classroom. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that students works at a classroom. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that students works at a school. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that students are capable of listen to teacher. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that interamerican is | 'csQuestionAskerRule' |

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| | | related to continent. I would suggest incorporating this idea into your BMC.' | |
| - | - | 'We know that university is an institution. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that people works at a apartment. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that people has property stupid. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that people are capable of talk to each other. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that people has a feelings. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that people receives action killed. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that people is a bisexuals. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that people are at location apartment. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that residents are at location apartment. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| | | 'We know that residents works at an apartment. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that residents works at a country. Is there anyone else related to this location who would also be interested in your | 'locationSimRule' |

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| | | business?' | |
| - | - | 'We know that residents works at a house. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that housing is an artifact. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that complex is similar to wn. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |

**Summary of Errol's performance on BMC 706:**

1. 24 total questions
2. Rule breakdown (semantic):
    a.14 by the "catch-all" rule
    b. 6 "location" questions
3. Rule breakdown (lexical):
    c.1 "too_broad" question
    d.1 "too_specific" question
    e. 2 "shorthands" question

## A.5. BMC 707

Figure 8 illustrates the contents of BMC 707 input to Errol and Table 6 summarizes its processing.

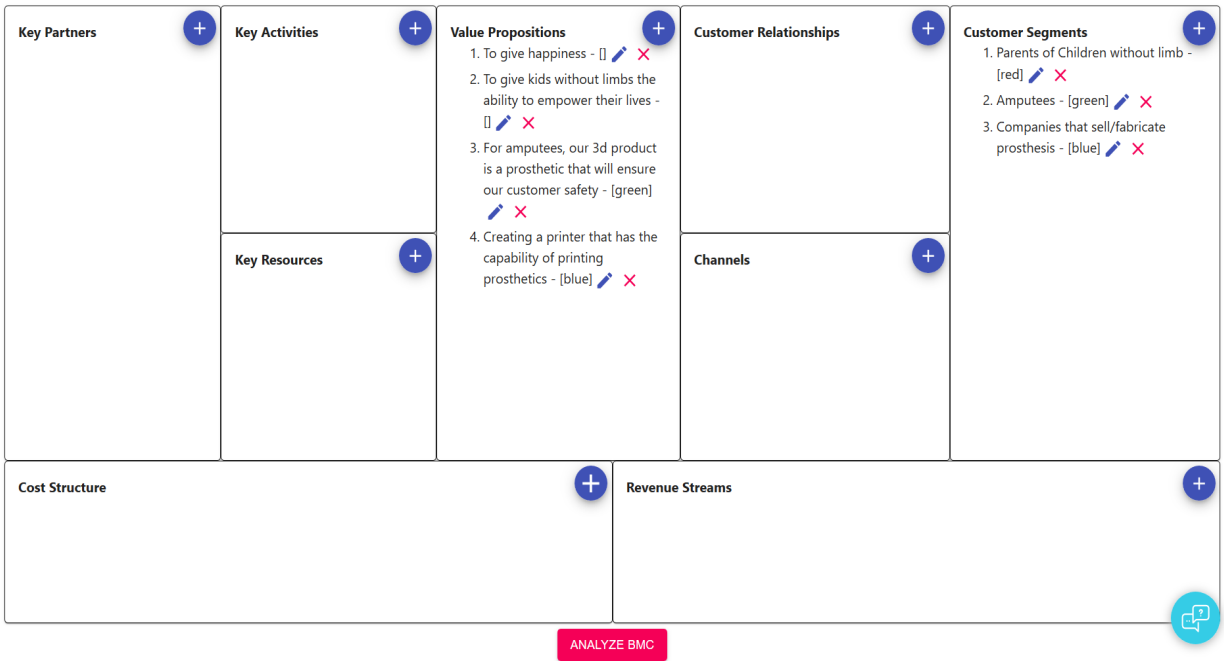


***Figure 8: Contents of BMC 707.***

**Table 6. Errol's processing for BMC 707.**

| Customer Segments | Value Propositions | Text | Rule |
|---|---|---|---|
| ['Parents of Children without limb', 'Amputees', 'Companies that sell/fabricate prosthesis'] | - | '"Parents of Children without limb" seem too broad. How could you narrow your customer segments?' | 'toobroad_mod' |
| ['Parents of Children without limb', 'Amputees', 'Companies that sell/fabricate prosthesis'] | - | 'How might you extend these to include more customers other than "Parents of Children without limb"?' | 'toospecific_mod' |
| ['Parents of Children without limb', 'Companies that sell/fabricate prosthesis'] | - | 'Do you think you could expand on these shorthands in "Parents of Children without limb"?' | 'shorthands_mod' |
| - | [['To give kids without limbs the ability to empower their lives', 'For amputees, our 3d product is a prosthetic that will ensure our customer safety']] | 'Would you mind expanding on some of these shortforms in "To give kids without limbs the ability to empower their lives"?' | 'shorthands_mod' |
| - | - | 'We know that parents are capable of name children. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that parents has property older than children. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that children are at location school. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that children works at a school. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that children are related to kids. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that children are capable of share toys. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that children are desires | 'csQuestionAskerRu |

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| | | play with toys. I would suggest incorporating this idea into your BMC.' | le' |
| - | - | 'We know that children has property noisy. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that limb is part of plant. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that limb is a body. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that companies are capable of market products. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that companies has a secretaries. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that prosthesis used for replacement of missing limb. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that prosthesis is an artifact. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | ['To give kids without limbs the ability to empower their lives'] | 'Who benefits from "To give kids without limbs the ability to empower their lives"?' | 'missingLink' |
| - | ['For amputees, our 3d product is a prosthetic that will ensure our customer safety'] | 'Who cares about "For amputees, our 3d product is a prosthetic that will ensure our customer safety"?' | 'missingLink' |
| - | ['Creating a printer that has the capability of printing prosthetics'] | 'Who cares about "Creating a printer that has the capability of printing prosthetics"?' | 'missingLink' |
| ['Parents of Children without limb'] | - | 'How is "Parents of Children without limb" being benefited?' | 'missingLink' |
| - | - | 'Do you think that there are enough customers to receive these values?' | 'csVPRatio' |

**Summary of Errol's performance on BMC 707:**

1. 23 total questions
2. Rule breakdown (semantic):
    a. 13 by the "catch-all" rule
    b. 1 "location" question
3. Rule breakdown (lexical):
    a. 2 "shorthand" questions
    b. 1 "too specific" question
    c. 1 "too broad" question
    d. 3 "missingLink" questions
    e. 1 "csVPRatio" question

## A.6. BMC 708

Figure 9 illustrates the contents of BMC 708 input to Errol and Table 7 summarizes its processing.

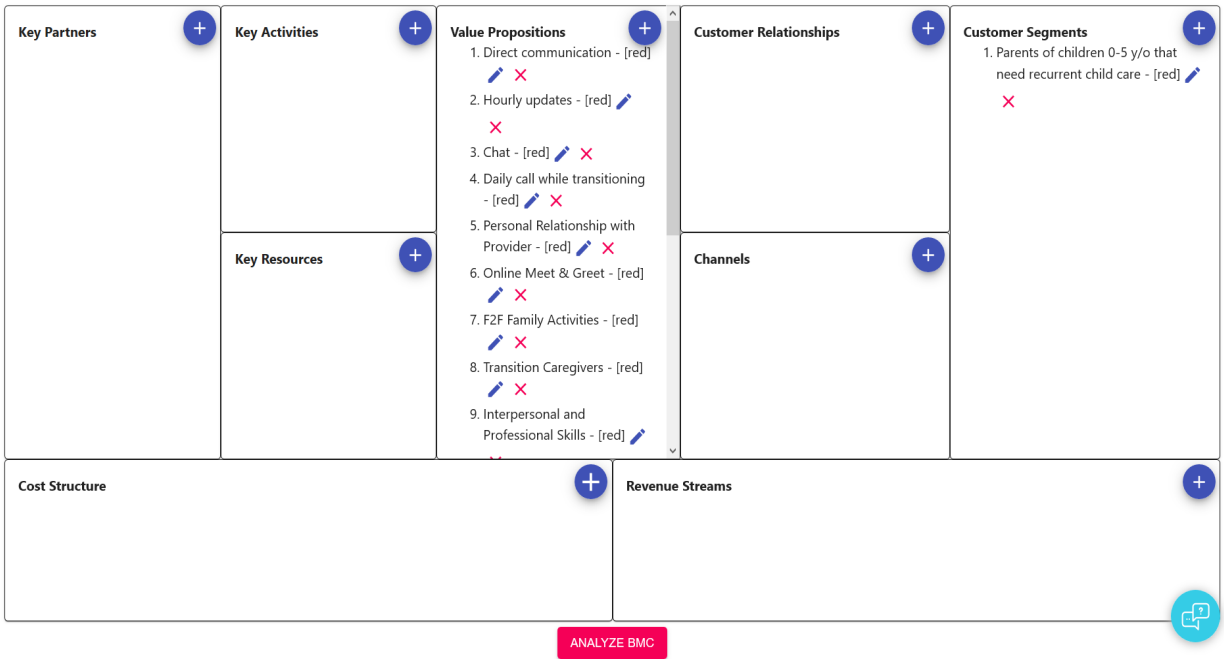


***Figure 9: Contents of BMC 708.***

**Table 7. Errol's processing on BMC 708.**

| Customer Segments | Value Propositions | Text | Rule |
|---|---|---|---|
| ['Parents of children 0-5 y/o that need recurrent childcare'] | - | 'Are these the only customers your business can provide for?' | 'modunder' |
| ['Parents of children 0-5 y/o that need recurrent childcare'] | - | 'Are these "Parents of children 0-5 y/o that need recurrent childcare" customer segments or something more like value propositions?' | 'actions_mod' |
| ['Parents of children 0-5 y/o that need recurrent childcare'] | | '"Parents of children 0-5 y/o that need recurrent childcare" seem too broad. How could you narrow your customer segments?' | 'toobroad_mod' |
| ['Parents of children 0-5 y/o that need recurrent childcare'] | - | 'Overall, do you think you are targeting enough people with "Parents of children 0-5 y/o that need recurrent childcare" or being too specific?' | 'toospecific_mod' |
| ['Parents of children 0-5 y/o that need recurrent childcare'] | - | 'Can you elaborate the shorthands in "Parents of children 0-5 y/o that need recurrent childcare"?' | 'shorthands_mod' |
| - | [['Direct communication', 'Hourly updates', 'Chat', 'Personal Relationship with Provider', 'Online Meet and Greet', 'F2F Family Activities', 'Transition caregivers', 'Interpersonal and Professional Skills', 'F2F parent/child/caregiver', 'Informed decisions', 'Reviews & Ratings']] | 'How will your company provide value to your customers? Why would they care about "Direct communication"?' | 'noactions_mod' |
| - | ['General for Value Propositions'] | 'Do you think your business can really offer that many value propositions? Why?' | 'modover' |
| - | [['F2F parent/child/caregiver', 'Reviews & Ratings', 'Aldea published | 'Can you elaborate the shorthands in "F2F parent/child/caregiver"?' | 'shorthands_mod' |

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|---|---|---|---|
| | interviews of providers & parents of children enrolled']] | | |
| - | [['F2F Family Activities', 'F2F parent/child/caregiver']] | 'Would you mind correcting the acronyms in "F2F Family Activities"?' | 'acronyms_mod' |
| - | - | 'We know that parents are capable of name children. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that parents has property older than children. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that children are at location school. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that children works at a school. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that children are related to kids. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that children are capable of share toys. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that children are desires play with toys. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that children has property noisy. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that child is related to young. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that child works at a school. Is there anyone else related to this location who would also be | 'locationSimRule' |

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| | | interested in your business?' | |
| - | - | 'We know that child is at location school. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that child is capable of become adult. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that child is desires learn. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that care is related to love. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that care is a state. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'Do you need 15 values for 1 customers?' | 'csVPRatio' |

**Summary of Errol's performance on BMC 708:**

1. 25 total questions
2. Rule breakdown (semantic):
    a. 13 by the "catch-all" rule
    b. 4 by "location" questions
3. Rule breakdown (lexical):
    c. 1 "modunder" question
    d. 1 "modover" question
    f. 1 "actions_mod" question
    g. 1 "too_broad" question
    h. 1 "too_specific" question
    i. 3 "shorthands"/"acronym" questions
    j. 1 "no_actions" questions
    k. 1 "csVPRatio" question

## A.7. BMC 709

Figure 10 illustrates the contents of BMC 709 input to Errol and Table 8 summarizes its processing.

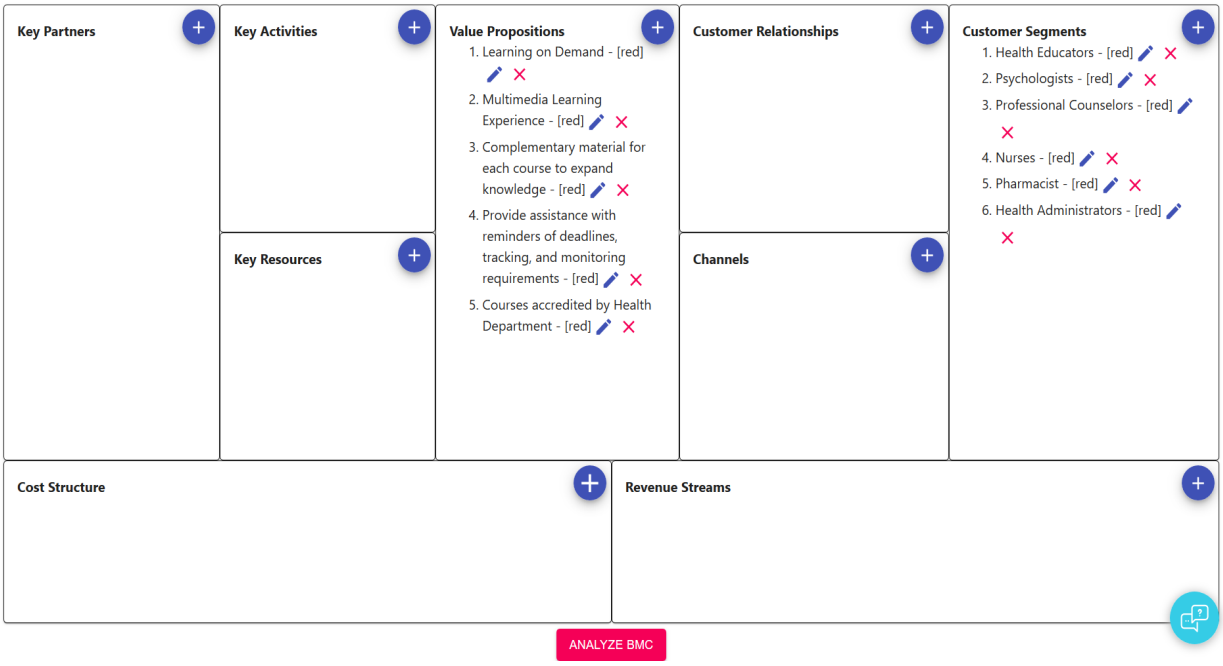


***Figure 10: Contents of BMC 709.***

**Table 8. Errol's processing on BMC 709.**

| Customer Segments | Value Propositions | Text | Rule |
|---|---|---|---|
| ['Health Educators', 'Psychologists', 'Professional Counselors', 'Nurses', 'Pharmacist', 'Health Administrators'] | - | 'Overall, could you try to be more specific about who you are trying to target with "Health Educators"?' | 'toobroad_mod' |
| ['Health Educators', 'Psychologists', 'Professional Counselors', 'Nurses', 'Pharmacist', 'Health Administrators'] | - | 'Can you expand on "Health Educators"?' | 'tooshort_mod' |
| - | [['Provide assistance with reminders of deadlines, tracking, and monitoring requirements']] | 'Would you mind expanding on some of these shortforms in "Provide assistance with reminders of deadlines, tracking, and monitoring requirements"?' | 'shorthands_mod' |
| - | - | 'We know that health is related to being. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that counselors are capable of give advice. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that nurses are capable of care for patients. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that nurses works at a hospital. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that nurses are at location hospital. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that nurses is a care givers. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that pharmacist is a person. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |

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| - | - | 'We know that health is related to well. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'Is every customer relevant to your business? Have you segmented your customers too much?' | 'csVPRatio' |

**Summary of Errol's performance for BMC 709:**

1. 12 total questions
2. Rule breakdown (semantic):
    a.7 by the "catch-all" rule
    b. 1 "location" question

3.Rule breakdown (lexical):
    c. 1 "too_broad" question
    d. 1 "too_short" question
    e. 1 "shorthands" question
    f. 1 "csVPRatio" question

## A.8. BMC 710

Figure 11 illustrates the contents of BMC 710 input to Errol and Table 9 summarizes its processing.

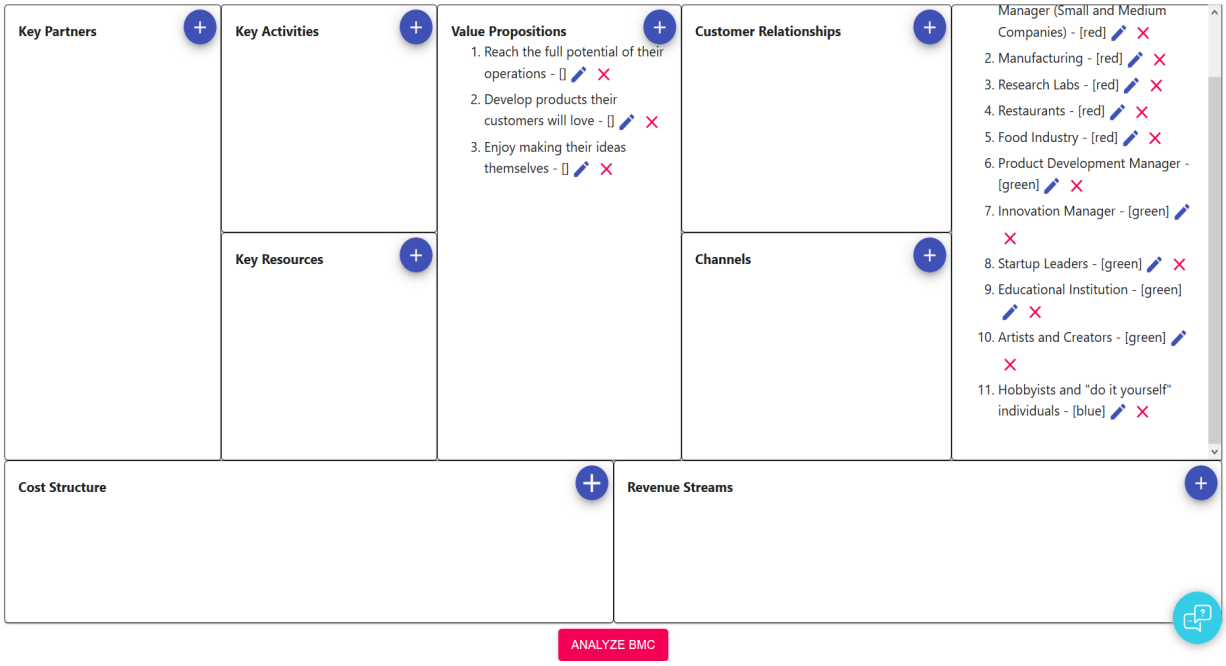


***Figure 11: Contents of BMC 710.***

**Table 9. Errol's processing for BMC 710.**

| Customer Segments | Value Propositions | Text | Rule |
|---|---|---|---|
| ['Operations and Research Manager (Small and Medium Companies)', 'Manufacturing', 'Research Labs', 'Restaurants', 'Food Industry', 'Product Development Manager', 'Innovation Manager', 'Startup Leaders', 'Educational Institution', 'Artists and Creators', 'Hobbyists and "do it yourself" individuals'] | - | 'Consolidate some of your customers.' | 'modover' |
| ['Operations and Research Manager (Small and Medium Companies)', 'Manufacturing', 'Research Labs', 'Restaurants', 'Food Industry', 'Product Development Manager', 'Innovation Manager', 'Startup Leaders', 'Educational Institution', 'Artists and Creators', 'Hobbyists and "do it yourself" individuals'] | - | 'I think you might benefit from focusing on a more targeted customer base than "Operations and Research Manager (Small and Medium Companies)". What do you think?' | 'toobroad_mod' |
| ['Manufacturing', 'Research Labs', 'Restaurants', 'Food Industry', 'Innovation Manager', 'Startup Leaders', 'Educational Institution'] | - | 'Do you think you could expand on "Manufacturing"?' | 'tooshort_mod' |
| ['Operations and Research Manager (Small and Medium Companies)', 'Hobbyists and "do it yourself" individuals'] | - | 'Can you elaborate the shorthands in "Operations and Research Manager (Small and Medium Companies)"?' | 'shorthands_mod' |
| - | - | 'We know that operations is an act. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that operations receives action done with anesthetics. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that research is manner of cognition. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that research is an act. I would suggest incorporating this idea into | 'csQuestionAskerRule' |

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| | | your BMC.' | |
| - | - | 'We know that manager is capable of chair meeting. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | We know that medium is a location. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that companies are capable of market products. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that companies has a secretaries. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that labs are form of n. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that labs is a in laboratories. I would suggest incorporating this idea into your BMC.' | ‘csQuestionAskerRule' |
| - | - | 'We know that restaurants is a places. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that restaurants receives action closed. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that restaurants has property opening at night. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that restaurants are capable of charge too much for food. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that food works at | 'locationSimRule' |

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| | | a refrigerator. Is there anyone else related to this location who would also be interested in your business?' | |
| - | - | 'We know that food is at location refrigerator. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that food works at a table. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that food works at a kitchen. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that food receives action eaten. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that food works at an oven. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that industry is an act. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that industry has context act. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that product is an artifact. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that development is an event. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that innovation is related to innovate. I would | 'csQuestionAskerRule' |

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| | | suggest incorporating this idea into your BMC.' | |
| - | - | 'We know that startup is an act. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that startup is related to boot. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that leaders are capable of chair meeting. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that leaders are form of n. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that leaders are antonym wheelers. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that institution is a cognition. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that artists are capable of paint portraits. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that artists works at a gallery_opening. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that artists are at location gallery opening. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | - | 'We know that artists works at an art_show. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |

| | | | |
|---|---|---|---|
| - | - | 'We know that artists works at a disneyland. Is there anyone else related to this location who would also be interested in your business?' | 'locationSimRule' |
| - | - | 'We know that artists has property powerful. I would suggest incorporating this idea into your BMC.' | 'csQuestionAskerRule' |
| - | ['Reach the full potential of their operations'] | 'Who cares about "Reach the full potential of their operations"?' | 'missingLink' |
| - | ['Develop products their customers will love'] | 'Who cares about "Develop products their customers will love"?' | 'missingLink' |
| - | ['Enjoy making their ideas themselves'] | 'Who cares about "Enjoy making their ideas themselves"?' | 'missingLink' |
| ['Operations and Research Manager (Small and Medium Companies)'] | - | 'How is "Operations and Research Manager (Small and Medium Companies)" being benefited?' | 'missingLink' |
| ['Manufacturing'] | - | 'How is "Manufacturing" being benefited?' | 'missingLink' |
| ['Research Labs'] | - | 'How is "Research Labs" being benefited?' | 'missingLink' |
| ['Restaurants'] | - | 'How is "Restaurants" being benefited?' | 'missingLink' |
| ['Food Industry'] | - | 'How is "Food Industry" being benefited?' | 'missingLink' |
| ['Product Development Manager'] | - | 'How is "Product Development Manager" being benefited?' | 'missingLink' |
| ['Innovation Manager'] | - | 'How is "Innovation Manager" being benefited?' | 'missingLink' |
| ['Startup Leaders'] | - | 'How is "Startup Leaders" being benefited?' | 'missingLink' |
| ['Educational Institution'] | - | 'How is "Educational Institution" being benefited?' | 'missingLink' |

| | | | |
|---|---|---|---|
| ['Artists and Creators'] | - | 'How is "Artists and Creators" being benefited?' | 'missingLink' |
| ['Hobbyists and "do it yourself" individuals'] | - | 'How is "Hobbyists and "do it yourself" individuals" being benefited?' | 'missingLink' |
| - | - | 'Will 3 be enough values to serve 11 groups?' | 'csVPRatio' |

**Summary of Errol's performance on BMC 710:**

1. 56 total questions
2. Rule breakdown (semantic):
    a. 30 by the "catch-all" rule
    b.7 "location" questions
3. Rule breakdown (lexical):
    c.1 "modover" question
    d.1 "too_broad" question
    g. 1 "too_short" question
    h. 1 "shorthands" question
    i. 14 "missingLink" questions
    j. 1 "csVPRatio" question

## Appendix B.

### B.1. BMC 713

Figure 12 illustrates the contents of BMC 713 input to Errol and Table 10 summarizes its response.

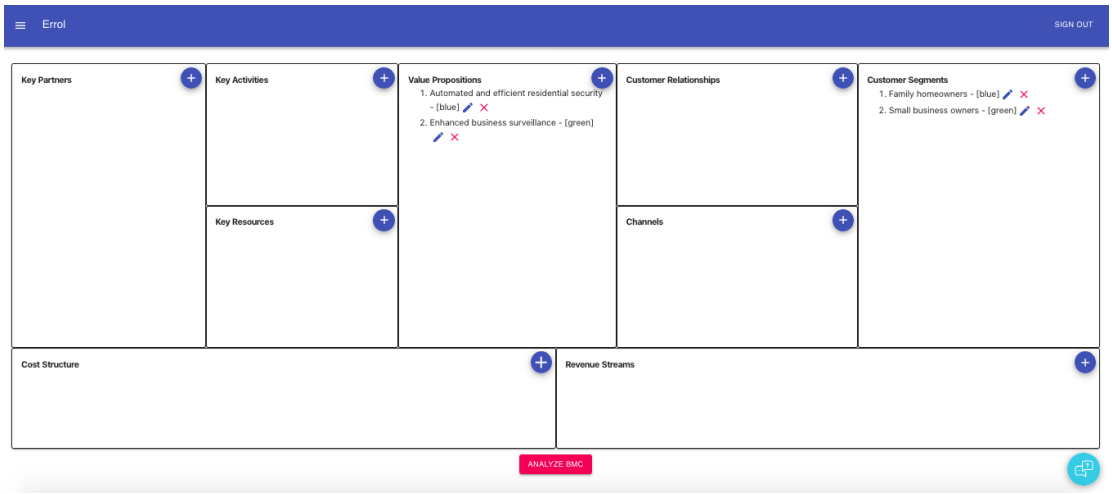


***Figure 12: Contents of BMC 713.***

**Table 10. Errol's Questions for BMC 713.**

| |
|---|
| How long did you spend working on your customer segment section? |
| I am concerned you are targeting too broad of a customer segment base with "Family homeowners" |
| I am concerned you might not be targeting enough people with "Family homeowners". What do you think? |
| Is there a reason why you do not have many value propositions? |
| We know that homeowners are capable of borrow money from bank. I would suggest incorporating this idea into your BMC. |
| We know that business is related to company. I would suggest incorporating this idea into your BMC. |
| We know that business works at a office_building. Is there anyone else related to this location who would also be interested in your business? |
| We know that business used for making money. I would suggest incorporating this idea into your BMC. |
| We know that business is at location office building. I would suggest incorporating this idea into your BMC. |
| Who cares about "Enhanced business surveillance"? |

## B.2. BMC 714

Figure 13 illustrates the contents of BMC 713 input to Errol and Table 11 summarizes its response.

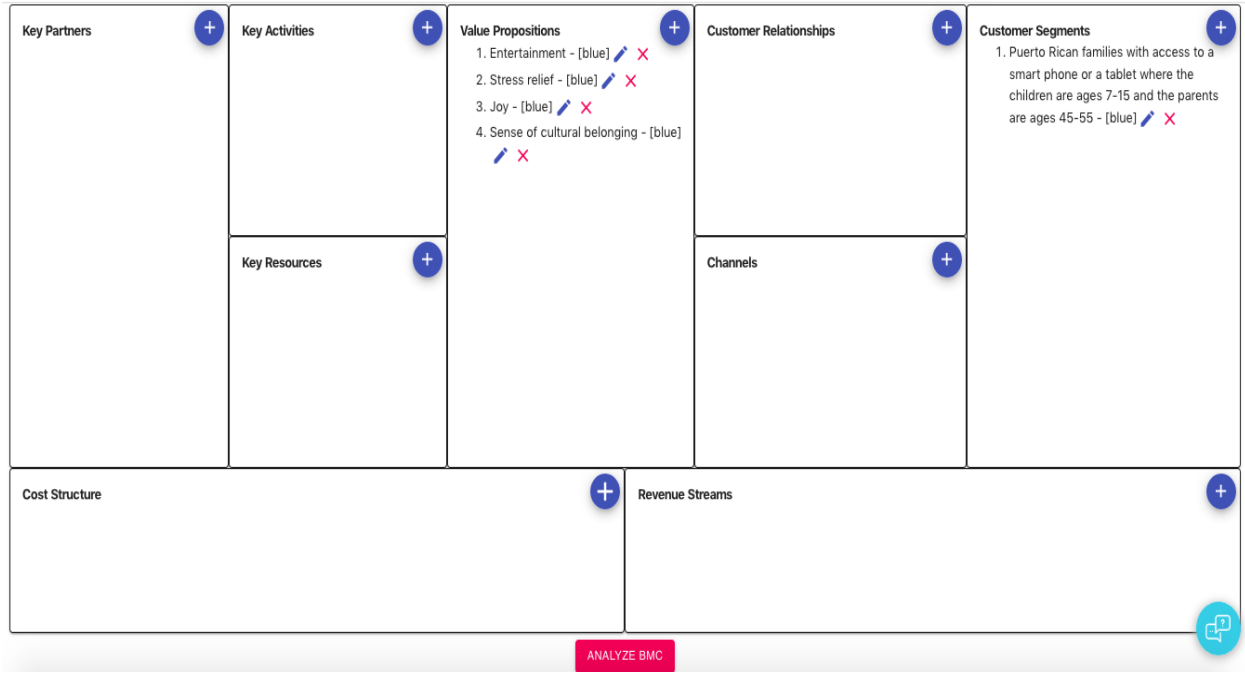


***Figure 13: Contents of BMC 714.***

**Table 11. Errol's Questions for BMC 714.**

| |
|---|
| I see that you have not mentioned many customers here. Did you not get enough time to work on this? |
| Please fix these "Puerto Rican families with access to a smart phone or a tablet where the children are ages 7-15 and the parents are ages 45-55" to real customer segments. Why do they have actions? |
| I think you might benefit from focusing on a more targeted customer base than "Puerto Rican families with access to a smart phone or a tablet where the children are ages 7-15 and the parents are ages 45-55". What do you think? |
| What are you trying to say? Can you be more concise with "Puerto Rican families with access to a smart phone or a tablet where the children are ages 7-15 and the parents are ages 45-55"? |
| Do you think the customers you are targeting "Puerto Rican families with access to a smart phone or a tablet where the children are ages 7-15 and the parents are ages 45-55" might be too narrow? |
| Could you please expand on these shorthands in "Puerto Rican families with access to a smart phone or a tablet where the children are ages 7-15 and the parents are ages 45-55" for me? |

Are "Entertainment" values or are they features? There is a difference.

Can you expand on "Entertainment"?

We know that families are at location park. I would suggest incorporating this idea into your BMC.

We know that families works at a park. Is there anyone else related to this location who would also be interested in your business?

We know that families works at a supermarket. Is there anyone else related to this location who would also be interested in your business?

We know that families has a same last name. I would suggest incorporating this idea into your BMC.

We know that families are capable of plan trips. I would suggest incorporating this idea into your BMC.

We know that access has context computer. I would suggest incorporating this idea into your BMC.

We know that access is a artifact. I would suggest incorporating this idea into your BMC.

### B.3. BMC 715

Figure 14 illustrates the contents of BMC 713 input to Errol and Table 12 summarizes its response.

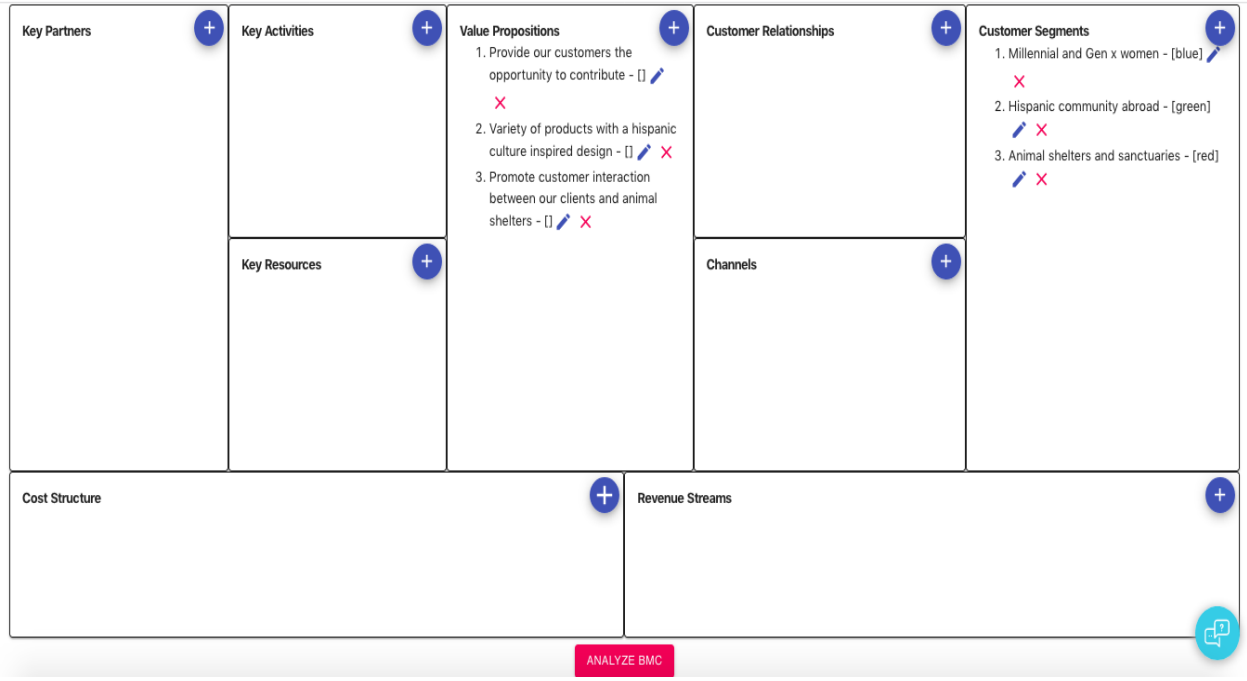


***Figure 14: Contents of BMC 715.***

**Table 12. Errol's Questions for BMC 715.**

**Hi Ashok!**

here are some things to consider

---

"Millennial and Gen x women" might be too broad. What do you think?

We know that millennial is related to generation y. I would suggest incorporating this idea into your BMC.

We know that gen is a communication. I would suggest incorporating this idea into your BMC.

We know that gen has context location. I would suggest incorporating this idea into your BMC.

We know that gen is related to fanfiction. I would suggest incorporating this idea into your BMC.

We know that x is capable of mark spot. I would suggest incorporating this idea into your BMC.

We know that x is related to cross. I would suggest incorporating this idea into your BMC.

We know that x is a communication. I would suggest incorporating this idea into your BMC.

We know that hispanic is related to spain. I would suggest incorporating this idea into your BMC.

We know that community is capable of value good morals. I would suggest incorporating this idea into your BMC.

We know that community is a group. I would suggest incorporating this idea into your BMC.

We know that shelters are form of n. I would suggest incorporating this idea into your BMC.

We know that sanctuaries are form of sanctuary. I would suggest incorporating this idea into your BMC.

We know that sanctuaries are related to sanctuary. I would suggest incorporating this idea into your BMC.

Who benefits from "Provide our customers the opportunity to contribute"?

Who cares about "Variety of products with a hispanic culture inspired design"?

Who benefits from "Promote customer interaction between our clients and animal shelters"?

How is "Millennial and Gen x women" being benefited?

How is "Hispanic community abroad" being benefited?

How is "Animal shelters and sanctuaries" being benefited?

### B.4. BMC 716

Figure 15 illustrates the contents of BMC 716 input to Errol and Table 13 summarizes its response.

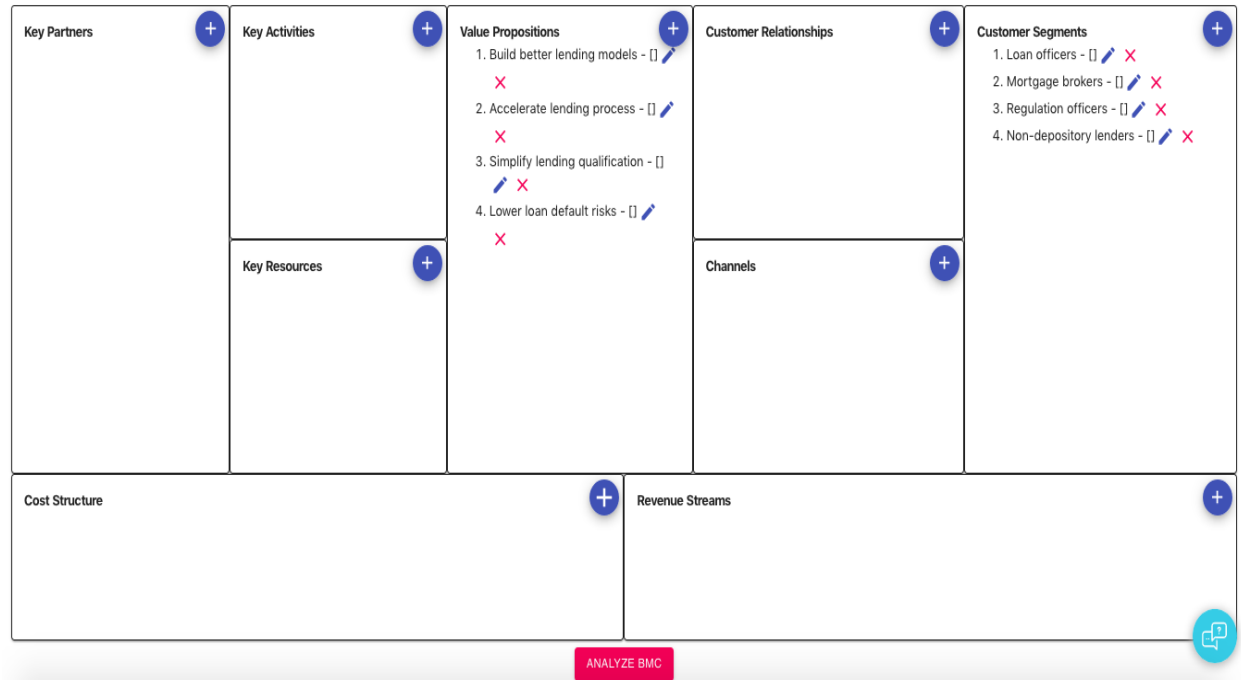


***Figure 15: Contents of BMC 716 input into Errol.***

**Table 13. Errol's Questions for BMC 716.**

**Hi Ashok!**

here are some things to consider

---

How could you narrow your customer segments "Loan officers"?

Can you tell me more about "Loan officers"?

How might you extend these to include more customers other than "Loan officers"?

Could you please expand on these shorthands in "Non-depository lenders" for me?

How would your customers benefit from "L"?

We know that officers are form of v. I would suggest incorporating this idea into your BMC.

We know that officers works at a fraternity_house. Is there anyone else related to this location who would also be interested in your business?

We know that officers are capable of fine scofflaws. I would suggest incorporating this idea into your BMC.

We know that officers receives action saluted. I would suggest incorporating this idea into your BMC.

We know that officers are at location fraternity house. I would suggest incorporating this idea into your BMC.

We know that mortgage is a possession. I would suggest incorporating this idea into your BMC.

We know that brokers are capable of trading stocks. I would suggest incorporating this idea into your BMC.

We know that regulation is similar to wn. I would suggest incorporating this idea into your BMC.

We know that regulation has context cognition. I would suggest incorporating this idea into your BMC.

We know that regulation is a act. I would suggest incorporating this idea into your BMC.

We know that lenders are capable of short stock. I would suggest incorporating this idea into your BMC.

Who cares about "Build better lending models"?

Who cares about "Accelerate lending process"?

Who benefits from "Simplify lending qualification"?

Who benefits from "Lower loan default risks "?

How is "Loan officers" being benefited?

How is "Mortgage brokers" being benefited?

How is "Regulation officers" being benefited?

How is "Non-depository lenders" being benefited?