

# Towards Reasoning About Pivoting In Startups With $i^*$

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**Abstract.** Software start-ups have embedded themselves in the economic zeitgeist as drivers of innovation and growth. ‘Unicorns’, such as Facebook, Uber, Pinterest, Dropbox, and Palantir, have ably demonstrated the market disrupting and industry transforming potential of upstarts that ‘punch above their weight class’. These successful businesses began as start-ups and matured into enterprises with multi-billion dollar valuations even though most start-ups fail or are abandoned within a few years of founding. A notable reason for the failure or abandonment of many start-ups is erroneous logic and faulty assumptions underpinning their products, business models, and engines of growth. The lean start-up approach encourages decision makers to test their fundamental hypotheses and effect strategic pivots to identify new and superior fundamental hypotheses. This paper outlines exploratory research into the modeling of strategic pivoting using  $i^*$ . It discusses the key concepts that are relevant for developing a framework for analyzing strategic pivoting in a structured and systematic manner using  $i^*$ . Such a framework can support decision-makers in start-ups to test the fundamental hypotheses underlying their products, business models, and engines of growth.

**Keywords:** Startup. Entrepreneurship. Design. Modeling. Review.

## 1 Introduction

Ries [1] promotes the notion of Lean Startup which encourages decision-makers at startup companies to pivot their products, business models, or engines of growth if tests disprove their fundamental hypotheses. Changes to a startup’s product, business model, or engine of growth that are catalyzed by disproving of their fundamental hypotheses are referred to as pivots [2]. Pivoting is useful for effecting strategic redirection in many situations such as when new competitors enter the market; novel substitute products are launched; key suppliers exit the market; technologies disrupt an industry; as well as when laws and regulations are changed. Pivots are also crucial for staving off bankruptcy if a startup is operating on unsound assumptions and incorrect logic since many startups typically operate with limited financial resources which can be wasted through mistakes. In this paper, we share our vision for a framework that supports the analysis of pivoting in a systematic and structured manner using  $i^*$ .

## 2 Pivoting In Startups

Ries [1] argues that a start-up may need to pivot multiple times and may also need to execute multiple pivots quickly. Pivoting affects a startup in significant ways because it establishes new fundamental hypotheses for its products, business model, and engines of growth [1]. Thus, the stakes are high if a startup executes an incorrect pivot or executes a required pivot incorrectly. Therefore, a structured and systematic framework for analyzing pivots can be valuable for decision-makers in a start-up. Ries [1] proposes a catalog of ten types of pivots which are described in Table 1. Decision-makers can benefit by analyzing the feasibility, viability, and desirability of these pivots in their start-ups in a coherent and methodical manner.

Pivot	Meaning
Zoom-in	Functionality that was formerly a single feature becomes the whole product.
Zoom-out	All the functionality in a product is considered insufficient for meeting the requirements of a customer segment and thus it is assimilated into another product whereby the original product becomes a feature in the larger product.
Customer Segment	The functionality in a product meets the needs of a certain customer segment that is different from the customer segment that it was targeted to and thus that product is positioned to a customer segment whose needs it satisfies.
Customer Need	The original need of a customer segment that a product is designed to meet is recognized to be less important than another need for that customer segment and thus the product is changed to meet the other more important need of that customer segment.
Value Capture	A company changes the way by which it captures value from its product such as by monetizing features individually or commercializing functionality holistically.
Engine of Growth	The company changes its growth strategy by focusing on different ways of growing market share, increasing revenues, and boosting margins.
Platform	A product is turned into a platform where other companies can also offer their products or conversely a platform on which other companies offer their products is changed into a product.
Business Architecture	A company changes from a margin business to a volume business or conversely from a volume business to a margin business.
Channel	A company changes its sales distribution channel as well as process to take its products to market more effectively.
Technology	A company changes the technology underlying an existing solution in order to benefit from better price or performance.

Table 1. Catalog of ten types of pivots (Source: Reis [1])

Feasibility pertains to the ability of a start-up to initiate a pivot. Some pivot types, though attractive, may not be possible because the start-up is not capable to start them. Desirability refers to a start-up's interest in undertaking a specific type of pivot. While a start-up may be capable of undertaking a type of pivot— it may not regard that type of a pivot as being suitable for it at that time. Viability refers to the ability of a start-up to successfully complete an on-going pivot. A start-up may commence a pivot but may not be able to finish it properly due to mismanagement. If adequate caution is not exercised in planning or implementing pivots then it can have deleterious impact on that start-up.

### 3 Towards Modeling Pivoting In Startups With i\*

There are certain general characteristics of i\* that make it useful for expressing and evaluating pivoting in startups. These include means-ends reasoning; refinement and elaboration; strategic dependencies between actors; distinction between actors, agents, roles, positions; and actor associations. Additionally, the semantics and notation of i\* are helpful for articulating and analyzing pivoting techniques that are listed in table 1. Features of i\* that are especially relevant for each type of pivot are discussed below. *i\** Strategic Rationale (SR) diagrams representing abstract patterns for four types of pivots are included below. Similar abstract patterns for remaining pivot types could not be included in this paper due to space constraints. The following diagrams only depict unidirectional dependencies (i.e., from customer to vendor) to simplify visual presentation. We have also omitted some goals and tasks within each actor or role for brevity and have shown this via a break in dependency links.

- Zoom-in/Zoom-out:** i\* supports the portrayal of decomposition and refinement as well as contribution and dependency links. Figure 1 presents an abstract i\* model of Zoom-in/Zoom-out pivots. A focal actor's (i.e., start-up) product (*PrdX*) features (*FtrX*) can be represented as softgoals that can be chained in a hierarchy such that the topmost softgoal represents a product. The objectives of a customer (*RqtX*), which is represented as another actor, can be expressed as softgoals which can be related to the focal actor's product via dependency links. These dependency links can be to the product as a whole or to constituent features of that product. This information about the dependency of particular user requirements on specific product features can be used to inform the analysis of the start-up's impact of offering distinct features as discrete products (zoom-in) as well as of combining multiple features into a consolidated product (zoom-out). In figure 1, solid (blue) downward arrows depict examples of zoom-in pivoting while dashed (red) upward arrows represent examples of zoom-out pivoting. Arrows depict examples of pivots among products.

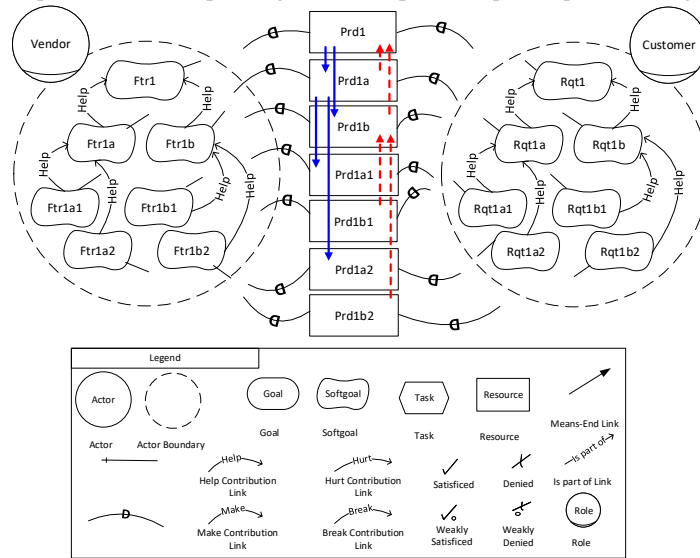


Figure 1. Abstract i\* model of Zoom-in/Zoom-out pivots

- Customer Segment:** i\* supports the representation of goals and softgoals within the individual scopes of various actors. This allows an analyst to group customers by their needs where customers with identical needs are represented as a segment. The support for actor associations (e.g., ISA, Plays, etc.) also make it possible to represent sub-segments of customers where customers share certain needs in common while maintaining their unique

identities. Figure 2 presents an abstract  $i^*$  model of Customer Segment pivot. This information can be used to reason about the requirements ( $RqtX$ ) that different groups of customers have for a product and to build customer value propositions ( $VPrX$ ) based on product offers ( $OfrX$ ) that are relevant to meet those requirements. In figure 2, arrows portray examples of pivoting amongst customer segments.

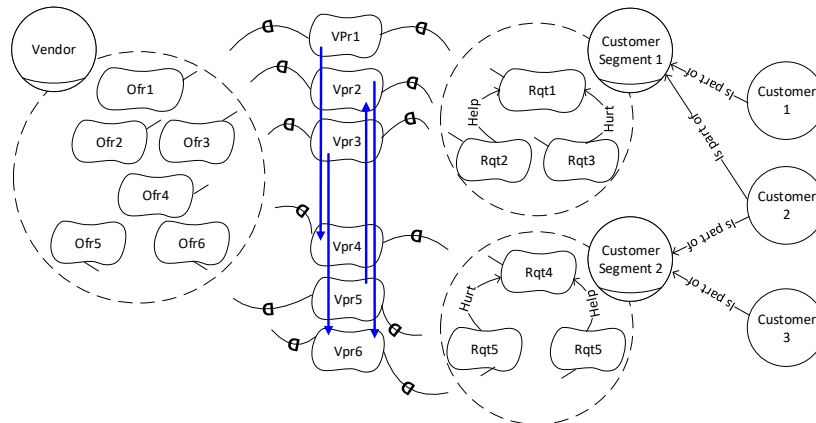


Figure 2. Abstract  $i^*$  model of Customer Segment pivot

- Customer Need:**  $i^*$  supports the depiction of goals and softgoals within the scope of each actor. It also supports the representation of contribution links between various types of entities. This allows an analyst to identify the needs of a focal customer (including those that are currently being met) as well as the connections between those needs. Figure 3 presents an Abstract  $i^*$  model of customer need pivot. This information can be used to analyze whether it is beneficial to transition to serving different customer needs ( $RqtX$ ) than those that are currently being catered to. Alternatively, it can be used to reason about whether it is advantageous to continue serving currently targeted needs while also catering to additional needs. Each of these scenarios might require the vendor to offer different products ( $PrdX$ ) to the customer. These products may be developed and delivered via different offers ( $OfrX$ ) that align differently with the focal actor's primary targets ( $TgtPrX$ ) and secondary targets ( $TgtScX$ ). While products are represented as physical or informational entities that satisfy customer requirements – offers are represented as tasks because they encapsulate specific ways of meeting customer requirements. A focal actor's decision to execute a customer need pivot must consider the impact of that pivot on its own targets and not be motivated merely by a desire to meet additional or different customer requirements.

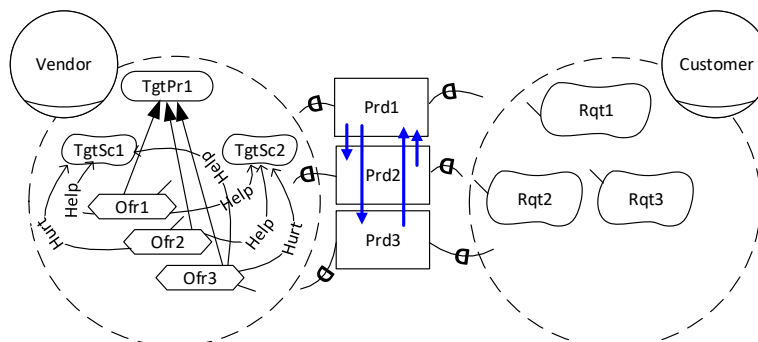


Figure 3. Abstract  $i^*$  model of Customer Need pivot

- **Value Capture:** i\* supports the portrayal of decomposition and refinement as well as contribution links. A product's features as well as their respective value inputs to the revenue stream can be represented as softgoals. These features and value inputs can be related to each other via contribution links. Equally importantly, the impact of features on value inputs of other features can also be related via contribution links. This information can be used to compare groups of features to evaluate the optimal bundles of features for achieving the value capture goals of the business.
- **Engine of Growth:** i\* supports the expression of goals and softgoals as well as means-ends and contribution links. Objectives of the business (such as growing market share, increasing revenues, and boosting margins) can be represented as goals and softgoals. The alternatives for achieving those objectives (e.g., paid, viral, sticky engines of growth) can be expressed as tasks. The impact of these alternatives can be portrayed via means-ends and contribution links. This information can be used to compare the impact of different alternatives on the current and future objectives. Moreover, as tasks can be decomposed it is possible to explore their strategic, tactical, and operational details to design blended engines of growth.
- **Platform:** i\* supports the articulation of strategic dependencies between any kind of actors such as customers, brokers, resellers, co-sellers, etc. In the case of a product, the relationship between the focal actor (i.e., business) and the customer can be shown via dependencies. Here, the customer depends on the business directly to meet its product needs while the business depends on the customer directly to meet its economic needs. However, in the case of a platform, customer and the partners only have direct dependency relationships with the business which is the platform operator. Here, the customer depends on the other actors (i.e., partners) indirectly to meet its product needs while the partners also depend on the customer indirectly to meet their economic needs. This information can be used to analyze whether more of its own objectives are served when it functions as a product vendor or as a platform operator.
- **Business Architecture:** i\* supports the expression of goals and softgoals as well as means-ends and contribution links. The objectives of a business architecture (e.g., maximize quantity, maximize price) can be represented as goals as well as softgoals the impact of different alternatives for achieving those objectives can be compared using means-ends and contribution links. This information can be used to analyze the impact that each alternative has on the currently selected objective and the prospective candidate objective. The current alternative may be equally suitable for serving both the present and future objectives or it may only be suitable for either of these in which case other alternatives may need to be considered.
- **Channel:** i\* supports the articulation of strategic dependencies between any kind of actors such as customers, brokers, resellers, co-sellers, etc. A channel can be depicted as the chain of dependencies from a focal actor (i.e., business) to a customer. Dependencies between the business and its customers without any intermediary actors can be thought of to constitute a direct channel. Whereas, if the business and its customers have dependencies with mutual intermediaries but not each other – then these can be regarded as constituting an indirect channel. This information can be used to reason about whether the benefits of using intermediaries (e.g., business softgoals of revenue scaling, market penetration, etc.) are outweighed by the vulnerabilities of a hold up problem.
- **Technology:** i\* supports the portrayal of softgoals, tasks, and contribution links. Technology alternatives can be represented as tasks and product features can be depicted as softgoals. The impacts of alternate technologies on product features can be shown via contribution links. Substitutive technologies (i.e., those that can be used to do the same thing) can be identified by finding tasks with similar contribution links to common softgoals. The impacts of different technologies on the overall bundle of features can be used to select the

future technology. The additional softgoals that are supported by the future technology compared to the past technology can be regarded as sustaining innovation.

## 4 Conclusion

Section 3 offered possible methods applying  $i^*$  to express and evaluate strategic pivoting by startups. There can be other approaches by which  $i^*$  can be used to represent and reason about pivoting. While many aspects of  $i^*$  make it an attractive modeling language for articulating and analyzing pivoting – it is also limited in three main respects in its ability to support such an endeavor. These include lack of support for temporal, sequential, and quantitative reasoning. Our future work is concerned with addressing these limitations as well as further developing the ideas discussed in section 3 prior to testing and validating them.

$i^*$  does not support the notion of relative or absolute time but both concepts can be relevant in analyzing pivoting. One condition that necessitates pivoting is when the burn rate of a startup (i.e., the speed with which it is spending its financial resources) exceeds its income and investments. If a startup does not pivot quickly enough then it can go bankrupt. So, time is an important dimension for reasoning about pivoting because it can be used to analyze whether or not pivoting is a necessary option for a startup. Moreover, the amount of time that a startup has to be able to pivot can determine which type of a pivot it can execute. For example, a product pivot may take more or less time for a startup than a customer segment pivot. Without being able to represent the time dimension in  $i^*$  means that it is difficult to identify which of these pivots are viable.

$i^*$  does not support the notion of precedence or subsequence but both concepts can be relevant in analyzing pivoting. A startup may only be able to execute a pivot after certain conditions are met. Similarly, it may only be able to perform other actions after it has pivoted. Without being able to show the sequential preconditions for pivoting it can be difficult to fully understand the feasibility of pivoting. Moreover, a start-up may need to execute a combination of pivots albeit in a certain order. For example, a start-up may first need to implement a zoom out pivot in order to implement a customer need pivot. Without being able to represent the sequence dimension in  $i^*$  means that it is difficult to show one pivot as a prerequisite for another pivot.

$i^*$  does not support quantitative reasoning but it can be relevant in analyzing pivoting. Reasoning about certain types of pivots is especially dependent on the concept of economic value. These include business architecture pivot, value capture pivot, and engine of growth pivot. In each of these pivots, different economic objectives are evaluated in quantitative terms. For example, they may need to exactly measure the attainment of numerical targets (e.g., revenue, margin, market share). While the attainment of these metrics can be represented in  $i^*$  in binary terms (i.e., as goals), their partial attainment cannot be depicted practically. Without being able to reason about quantitative aspects of pivoting in  $i^*$  means that it is difficult to analyze the economic impact of certain types of pivots in a precise manner.

## 5 References

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