

On Value Creation in Developer Relations (DevRel): A Practitioners' Perspective

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ABSTRACT

Software Ecosystem (SECO) comprises third-party developers cooperating and competing when contributing to a platform provided by a central organization (keystone). A keystone has invested in a Developer Relations (DevRel) internal team as a global business strategy to attract and engage a critical mass of third-party developers in producing and evolving contributions. For this reason, the DevRel team should promote social relationships among SECO actors and synergy among keystone's goals and developers' expectations. It can help to establish and sustain a competitive value creation network (VCN) within a SECO that must survive to inherit changes. However, it is still a challenge the way DevRel team can act on a SECO to better engage the developers' communities aiming to establish a robust VCN. In this paper, we advance on investigating the perceptions of 31 DevRel practitioners from large, medium and small-size companies based on seven countries about value creation in DevRel. We found 55 elements of value creation distributed in retention, efficiency, innovation, and complementarity. Based on our analysis, we contribute with a set of seven insights (feedback loop, loyalty program, roadmap enhancement, technical training, processes restructuring, innovative products, cost reducing) and a DevRel VCN that involves elements, suppliers and consumers. It fosters a common perspective for DevRel practitioners, keystones and researchers for designing strategies and a research roadmap.

CCS CONCEPTS

• **Software and its engineering** • Software creation and management • **Collaboration in software development**

KEYWORDS

Developer Relations, Value Creation, Software Ecosystem

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1 Introduction

The new dynamic of interactions between third-party users, developers, companies around a common platform has moved the organizations that maintain software platforms towards expanding their platforms, attracting developers and meeting the demands of users [1][2]. This scenario, which involves technical (i.e., the development process), social (i.e., interaction among users, companies and third-party/internal developers), and business (i.e., synergy surrounded by organizational intentions and developer expectations) dimensions, has been known as Software Ecosystem (SECO) [3].

Organizations such as Amazon, Apple, Facebook, Google, and Microsoft have invested in an infrastructure to engage a critical mass of third-party software developers. It can help keystones in developing and evolving contributions to SECO platform [4][5]. An engaged mass of developers also promotes the SECO in communities, provides relevant insights to keystones and sustain a competitive ecosystem. For example, in the mobile SECO (MSECO) context, Android has about 5.9 million developers¹ involved in creating apps, technical resource or developer events (e.g., conferences, hackathons). The developers' engagement leads to complement the value that the platforms offers to their costumers [6]. A SECO platform depends on developers because the platform's attractiveness is determined by a frequent evolution of its software offerings [7].

There is a need for strategies to support the SECO capacity to increase or maintain its developer communities over time and survive inherent changes [8]. In this scenario, the Developer Relations (DevRel) team emerge as a possible strategy. DevRel can be defined as [9]: "it is about *creating a vibrant ecosystem of third-party developers, by being the interface between those developers and the platform's product, engineering, and design teams*". As part of SECO governance, planning and execution of DevRel activities is not trivial and focus on delimiting developer actions without excessively restricting the desired level of value creation [10] [11]. DevRel practitioners need to have a realistic

¹ Statista, "App Developers - Statistics & Facts," <https://www.statista.com/topics/1694/appdevelopers/>, 2019

view of value creation within the SECO aiming to meet the needs of developers and achieve keystone goals [1] [2] [12].

A challenge in the scenario presented above is understanding value creation in DevRel, both to communicate internally to keystone the investments made in DevRel and to better utilize the critical mass of developers. Therefore, studying the value creation in DevRel activities is important because it can:

1. Guide organizations in constructing and evolving DevRel strategies; and
2. Be used by researchers and practitioners to structure the mechanisms of value creation and DevRel and to conduct further research.

We conducted a set of interviews involving 31 DevRel experienced practitioners from seven countries (Brazil, Canada, China, Germany, Israel, Mexico, and UK) involved in SECO and performed a qualitative data analysis to capture the perceptions of value creation in a DevRel scenario. We contribute with a set of seven insights (feedback loop, loyalty program, roadmap enhancement, technical training, processes restructuring, innovative products, cost reducing) and a DevRel VCN that involves elements, suppliers and consumers.

This paper is organized as follows. In Section 2, we present the concepts regarding SECO, DevRel, and Value Creation. In Section 3, we discuss the research method applied in this study. In Section 4, we present results' analysis including the elements of value creation, a set of insights, and suppliers and consumers of the DevRel value creation network. The related studies are discussed in Section 5. In Section 6, we present the threats to validity. Finally, in Section 6, we discuss the conclusions and future work.

2 Background

The relationships that emerge with the evolution of software development, which are composed of components, infrastructure and services of other companies, moved the scenario of a software product towards a SECO platform [13]. Manikas [3] define SECO as: *“the software and actor interaction in relation to a common technological infrastructure, that results in a set of contributions and influences directly or indirectly the ecosystem”*.

There are roles in the SECO, such as: keystone, developer, and developer relations team. A keystone is responsible for governing the ecosystem by applying rules and providing infrastructure to SECO expansion [14]. A developer produces and evolves contributions to platform and communities [4][5]. There are also internal keystone employees supporting developers in SECO onboard, engagement and recognition. These roles are known as [1] [15]: developer advocate, developer evangelists, partner engineer etc. They compose an internal team called **Developer Relations (DevRel)**.

DevRel as the public interface of ecosystem products and platform is responsible for the critical task of translating developer community interactions into trusted relationships with the organization [10]. DevRel can be understood of a set of instruments to forge and nurture a thriving community that

maintain collaborative relationships between developers and keystone [16].

DevRel must be conducted in a win-win context: balance between developers' goals and ecosystem platform's value [11][17]. It affects business and economic features of industry and the quality of ecosystem platform. In this scenario, SECO actors' activities are motivated by value creation both towards the actor and the ecosystem [3] [12].

Value creation is defined by Bowman and Ambrosini [18] as the difference between use and exchange of value at several levels of analysis. In this study we use the framework of Amit and Zott [19] that was proposed to analyze aspects of e-business products regarding the value creation. This framework has been selected because it provides insights into the value sources on e-business models. In addition, this is a much-cited work in the scientific community, with about 7,000 citations by January 2020.

This framework was used by Hyrynsalmi *et al.* [20] to analyze the value sources in a SECO from the perspective of mobile application developers. Cristofaro [21] also uses the value creation sources indicated by Amit and Zott to analyze the mobile applications' business models.

A value creation network also comprises products and transactions. In this paper, “product” refers to contributions produced or consumed by DevRel practitioners, which involve technical resources such as: source code, developer events, technical solutions, and engagement in questions & answers portals. On the other hand, “transactions” refers to exchanges among a keystone, DevRel team and developer community. Amit and Zott's framework is composed by four value sources creation:

- 1) *Efficiency*: the transaction efficiency increases as the cost of transactions within the ecosystem decreases. Several mechanisms exist to reduce costs, for example product search costs for DevRel practitioners and developers;
- 2) *Retention*: the developers are motivated to engage in transactions continuously and are willing to continue their relationship with the keystone. A retention situation can result in increased willingness for developers to consume more products from the ecosystem;
- 3) *Complementarity*: it involves the scenarios of grouping multiple products as a way to generate more value than offering the same set of products separately;
- 4) *Innovation*: the successful exploration of new products and services, as well as the introduction of new methods of conducting and organizing the business.

Each value source consists of items that allow its operationalization – called operationalizing items. Such items helped us to classify the perceptions of DevRel practitioners. It was used as categories in qualitative data analysis. Each set of operationalizing items related to a value source is described in the section of results.

3 Research Method

Our research method considers a qualitative approach that guides us to the understanding on how the DevRel practitioners perceives the value creation during their activities. Then, a set of semi-structured interviews was conducted with professionals from DevRel area. We based the plan, execution and analysis of the interview on guidelines proposed by Hove and Anda [22] and by Witschey and Murphy-Hill [23].

The purpose of our interviews, based on the GQM approach [24], was to *analyze* a set of comments with the purpose of characterizing them *with respect to* value creation perception in DevRel *from the point of view of* practitioners *in the context of* DevRel activities for developer retention in SECO. The research question that helped us to answer our goal are: “*What is the perception of DevRel practitioners about value creation and how it can be operationalized?*”.

Prior to starting the interview, we explained the goal of the research and asked for consent to record the audio from interview. All participants were encouraged to speak freely while answering the questions. We conducted the semi-structured interviews via Skype or Google Hangouts with participants.

As a first step, the participants were asked about their experience regarding their education, role in DevRel, the ecosystem in which they work/worked, and the size of the organization they work/worked for. Then, we asked the participants using the following questions:

1. In your opinion, what is Developer Relations (DevRel)?
2. How do you perceive the value creation in DevRel?
3. What are the suppliers and consumers of value creation in DevRel?

Each interview took approximately 40 minutes. In all interviews, we took notes to facilitate our analysis. All interviews were recorded. At the end of each interview, notes were discussed with the respective interviewees aiming to ensure they reflected what was discussed during the interviews.

3.1 Study Participants

To participate in this study, 97 DevRel practitioners identified on LinkedIn with the job title involving the term “developer relations” were contacted – 31 demonstrated interest to be interviewed (in this study they are represented as P01 until P31). All participants work or have worked with at least one of the following SECO: Android, iOS, Nokia, Windows, Actions on Google, Amazon Web Services, Facebook, Google Cloud Platform, IBM Cloud, JVM, Linux, Maemo, Microsoft Azure, OSX, Shopify, Twitter, and Unity. They also work in subsidiaries of those organizations in Brazil, Canada, China, Germany, Israel, Mexico, and UK. The interviewed participants include heads, managers, developer evangelists, developer advocates, and developer program engineers.

The participants have an average of 4.8 (\pm 3.26) years of professional experience at DevRel. On average, they planned and performed 44.8 (\pm 64.30) events (e.g., hackathon, training sessions, developer conference, meetups) with developers as part

of their DevRel activities. Considering the size of the organizations in which they are employees, we had the following scenario: 15 (48.39%) work in large companies, 10 (32.26%) in medium companies, and 6 (19.35%) in small companies.

3.2 Data Analysis

In this study, we performed a thematic analysis from DevRel practitioners' comments who participated in the study. Thematic analysis is a method for identifying, analyzing and reporting patterns/themes from a dataset [26].

The method was applied over 31 DevRel practitioners' interview full transcription documents. The following steps were performed by five researchers with experience in SECO and qualitative data analysis (at least 5 years):

- 1) *Read and re-read interview data*: two researchers read the interview transcripts to verify for consistency with the audio files;
- 2) *Generate initial codes*: three researchers analyzed participants' comments. The framework of Amit and Zott [19], which deals with aspects of value in business, was used as a basis. It helped to extract 54 fragments of comments. These fragments were associated to the items that operationalize the value sources indicated by Amit and Zott, 19 (35.2%) of these fragments were classified as related to “Retention”, 12 (22,2%) to Efficiency, 12 (22,2%) to Innovation, and 11 (20,4%) to Complementarity;
- 3) *Combine codes*: by conducting a consensus meeting, the five researchers reviewed the codes using the guideline proposed in Amit and Zott's framework. In this step, the researchers discussed about the suppliers and consumers.

The next steps helped in the discussions related to suppliers, customers and insights focused on the value creation network: 4) Look at how data is supported by themes; 5) Define each theme; and 6) Decide which themes make meaningful contributions to the understanding of what is going on from the dataset.

4 Results and Discussion

In the next sections, we present each operationalizing item related to value source. Next, we discuss the DevRel practitioners' comments and the elements that compose the operationalizing items. We also describe for each element their suppliers and consumers. Finally, a set of insights regarding the results is discussed.

4.1 Retention

The retention operationalizing items from Amit and Zott's framework are: *Loyalty Program*, *Confidence*, *Customization*, *Contact Point*, *Virtual community*, and *Network Effect*. The identified items in the 19 retention comments' fragments are distributed as follows: 5 (26.3%) for Contact Point, 4 (21.1%) for both Loyalty Program and Confidence, 3 (15.8%) for Network Effect, 2 (10.5%) for Virtual Community, and 1 (5.2%) for

Customization. In Tables 1 to 6, we present the supplier and consumer for each element associated to retention operationalizing items presented in the next paragraphs.

Regarding the **Contact Point**, the practitioners' comments cover the good relationship between DevRel practitioners and the developer. This makes it easier to understand developer expectations. The construction and maintenance of a good relationship can be identified as a DevRel pillar, because DevRel team acts as a bridge among developers, keystone and other SECO actors.

"It's a good relationship between evangelist and developer. (...)" - P13

Another identified element is the DevRel practitioner's ability to empower their technical audience by understanding their needs and expectations to provide a flow of developer advancement in the SECO.

"(...) And that defines how you need to approach your audience, how you need to be present for your audience, but also the expectations you can set with them and the understandings you have when working with them." - P17

Table 1. Contact Point - Suppliers and Consumers.

Element	Supplier	Consumer
Good Relationship	Developer DevRel	Developer DevRel
Getting Feedback	Developer DevRel Keystone	Developer DevRel Keystone
Probability of Recommending SECO platforms and resources	Developer Keystone	Developer Keystone
Developer Expectations	Developer	DevRel
Technical and Empowered Audience	DevRel	Developer DevRel Keystone
Official Gifts	DevRel	Developer

DevRel's practitioner action should bring the developer closer to the product as a way of getting feedback. The feedback also leads to understanding the probability of a developer recommend SECO platforms or resources to another developer.

"(...) This is where you ask someone who has subscribed to the likelihood of recommending your service to someone else." - P25

The Contact Point also allows the DevRel practitioner to keep the developer closest to the keystone perceiving developer's expectations and producing what it really needs.

"Keep them excited by giving them value through new opportunities, and if that value will return to you." - P30

As a way to foster the link between developer and DevRel, this team can offer official gifts (e.g., gadgets, vouchers, shirts) to create an identity of developers with SECO platforms. Such official gifts are part of a DevRel budget provided by keystone.

"Engage developers during events by offering them shirts and then dragging them to a computer and giving them a demo, not to wrap them in the product, but to get their product feedback." - P23

The **Loyalty Program** comments indicate the value of the official recognition of the developer by the keystone as a way to drive their engagement.

"Public recognition. Praising some specific developers in your media can be a big boost to your ego and your business ..." - P24

The value is still linked to long-term relationships within the ecosystem. The intensity and duration of developer engagement are important to DevRel demonstrates the maturity of SECO.

"... Building long-term community relationships, which is an essential aspect of the approval economy." - P28

This leads to a community of experts who in addition to generating relevant contributions can serve as support to DevRel team for other developers.

"When developers can increase your value, reach and recognition by developing your platform and growing your audience, they will be much more dedicated to you and your brand ..." - P30

The developers need to realize that keystone supports them within the ecosystem. The access to developer programs as software beta access programs, advanced SDK and APIs, testing tools and app analytics, for example, provide the developer with what is needed for this perception. In developer programs, DevRel practitioner rewards products' continued use or purchase.

"Especially successful or innovative apps deserve a pat on the back, so take one and let your developers know you're paying attention. Create and communicate the availability and access to technical developer programs." - P7

Table 2. Loyalty Program - Suppliers and Consumers.

Element	Supplier	Consumer
Official Recognition	Keystone	Developer
Long-term Relationships	Developer	Developer DevRel Keystone
Experts Communities	Developer	Developer DevRel
Developer Programs	DevRel Keystone	DevRel Developer

Regarding the **Confidence** item, the comments indicate the credibility of DevRel practitioners as a relevant value. Credibility can be related to technical knowledge and experience; budget and community management; or ability to conquer developer community respect. A keystone must structure, maintain and monitor a DevRel team with valid credibility.

"(...) Engage with credibility, even if it means recommending a competing solution." - P28

"(...) It's about building trust with developers (...)" - P3

As a result of trusting in companies that comprise the ecosystem in the work of DevRel practitioners, it is the interaction between the most experienced developers with the industry partners.

"Presentations for industry peers. An e-mail about that seasoned developer - with appropriate shared-contact information - can go a long way in creating good feelings." - P24

The scale and size of communities of the ecosystem are values that aid in the reliability of other developers, as a SECO only remains sustainable and growing with actors and interactions that enable it. The scale and size of communities are also related to, for example, resources availability, developer evolution, developer events to specific niches.

"(...) Another point is in scale and size. So talking about the size of our ecosystem is a point of reliability (...)" - P19

Table 3. Confidence - Suppliers and Consumers.

Element	Supplier	Consumer
Devrel Credibility	Keystone	Developer
Interaction with Industry Partners	Developer	Developer DevRel Keystone
Scale and Size of Developer Communities	Developer	Developer DevRel Keystone

The comments of Network Effect item focus on actions that allow face-to-face and web-based contact with the developer community, such as seminars, developer conferences, hackathons, events, tool demonstrations, and webinars. These methods can help in increasing the number of developers in an organic way (without the initial contact with a DevRel practitioner).

"Seminars, spoken events, webinars, demos - whatever you do to get your attention to the world, invite some developers to share the spotlight and help explain things as they expose themselves (...)" - P24

The planning and execution of these developer events involving developers in conjunction with DevRel practitioners in community outreach is valuable.

"They want to go there and teach the world why it's so good." - P26

The scenario discussed above drives developers themselves to act as ecosystem ambassadors that support the expansion of DevRel's actions primarily to attract more developers. The ambassador can be understood as an official role of a third-party

developer with recognized contributions for SECO that can act as part of DevRel team operations.

"(...) constructing a ambassadors' network - within the third-party developers' community - directly associated to me. It can help me to support more developers to enter the market" - P2

Table 4. Network Effect - Suppliers and Consumers.

Element	Supplier	Consumer
Face-to-face and web-based content	DevRel	Developer DevRel
Interaction with industry partners	Keystone	Developer DevRel
Ecosystem Ambassadors	DevRel	Developer DevRel
Interaction among developers and DevRel team	Developer DevRel	Developer DevRel

Regarding the Virtual Community item, P07's comment strengthens the use of the community to foster the establishment of a robustness network involving developers and other ecosystem actors. It strengthens the DevRel practitioner's work by broadening the action, as suggested by participant 26: *"And so they become part of their community and become part of their broader developer relationships than that you can achieve."*

Table 5. Virtual Community - Suppliers and Consumers.

Element	Supplier	Consumer
Robustness Network	Developer DevRel Keystone	Developer DevRel Keystone

Regarding the Customization item, by the concept of a SECO, it is known that one of the main goals is to expand the platform, which already includes a SECO platform customization supported by developers' contributions.

The participant P22 commented that the value around this is to allow new products to be created through infrastructure: *"Helping developers build software for customers using the APIs and ensuring they can make a living from these projects is very satisfying."*

Table 6. Customization - Suppliers and Consumers.

Element	Supplier	Consumer
Infrastructure	Keystone	Developer DevRel

Below, we provide some insights as result of the analysis of elements and their suppliers and consumers. The first one is related to how "Contact Point" can create a communication flow from top-down (keystone to developers) and bottom-up (developers to keystone) among internal organizational areas and external partners:

Insight #1: *The establishment of good and strong relationships among third-party developers, DevRel practitioners and keystone can allow the establishment of a feedback loop that supports various business/technical areas of the keystone's organizational structure, such as product production and evolution, DevRel area structure, and DevRel monitoring strategies for developer retention.*

The previously mentioned retention value creation items affect the collaboration and competition networks within a SECO. One of the mechanisms indicated by the participants in this study involves the establishment of an ambassador's team who are community developers who assist in the actions of DevRel practitioners. It leads us to the following insight:

Insight #2: *The ambassadors are the result of planning and running loyalty programs with third-party developers. These loyalty programs include official developer recognition, long-term keystone relationships, and a community of experts that have access to advanced technical resources.*

4.2 Efficiency

The identified items in the 12 comments' fragments are distributed as follows: 5 (41,7%) to Selection Range, 4 (33,3%) to Symmetric Information, 2 (16,7%) to Simplicity, and 1 (8,3%) to Search Cost. In Tables 7 to 9, we present the supplier and consumer for each element associated to efficiency operationalizing items presented in the next paragraphs.

In relation to the **Selection Range** item, the practitioners' comments indicate as value the resources desired by developers that can help them in generating monetary transactions during the use of SECO products.

"When someone pays for your product, your motivation is to get the desired resources so that they pay for the product. And your main challenge is to find out what they are." - P17

The resources desired by developers can indicate their engagement and the possibility of evolving contributions. So, another point is the set of contributions developed by developers that are promoted within the SECO.

"Promote your apps. Driving app downloads creates a lot of value in terms of developer relationships and also helps to sell your platform." - P24

It helps to promote the quality of the platform for both developers and users. These elements lead us to the following insight:

Insight #3: *The product and marketing organizational areas can use monitoring tools to direct the product roadmap to developers. In this way, it enhances the ability to engage in the evolution of products around the platform. This can favor the competitiveness of SECO's products and services.*

In order for the desired resources to be offered and products to be promoted, an aspect that helps and is valuable from the point of view of the participants is the technical training of the

developers. Technical trainings involving SECO technologies can be considered as a main activity of a DevRel team.

"Focuses on training developers to take advantage of our APIs ..."- P22

"Technical training." - P5

Insight #4: *The technical training planned and conducted by DevRel can be strongly influenced by SECO product roadmap. It is an opportunity to onboard and mature the developer community.*

Table 7. Selection Range - Suppliers and Consumers.

Element	Supplier	Consumer
Desired Resources	Developer	Developer DevRel
Promoted Developer Products	Keystone	Developer DevRel
Technical Training	DevRel	Developer

The **Symmetric Information** item addresses aspects related to the DevRel area as an articulating agent for the flow of information about ecosystem products among DevRel professionals, organization, and developers. It favors communication and trust around information produced by developers based on DevRel's actions.

"There are many moving parts (engineering, PM, marketing, professional services, business development, etc.) and DevRel is the grease that keeps the machine moving." - P12

"Strong communication and trust." - P13

Awareness about ecosystem products for all possible people interested in the use and expansion. In order to favor this expansion, the production and availability of qualified content for the SECO is necessary.

"(...) increasing awareness about your product." - P28

"(...) It is quality content that can help a developer to grow (...) helping the developer learn more efficiently, providing maximum value to him." - P22

Table 8. Symmetric Information: Suppliers and Consumers.

Element	Supplier	Consumer
Articulating Agent	Keystone	DevRel
Communication and Trust	Developer DevRel	Keystone
Awareness about SECO products	Keystone DevRel	Keystone Developer DevRel
Qualified Content	Developer	Keystone

Regarding the **Simplicity** item, comments indicate the communication of the organization's vision and expectations as well as clarity about the robustness of the ecosystem.

"In fact, selling the vision and expectations around the platform to customers. Thus, sales are the first point of contact for customers and they need to understand the vision of their platform." - P19

"... you need to be clear about how to go back if there is a problem." - P16

The organization's vision and expectations can be used to establish a synergy among developers, DevRel and SECO actors. In this context, the robustness of an ecosystem is important because it sustains the developer communities around the SECO platform.

Table 9. Simplicity - Suppliers and Consumers.

Element	Supplier	Consumer
Organization's Vision and Expectations	Keystone	DevRel
Ecosystem Robustness	Keystone	Keystone DevRel Developer

Regarding the item **Search Cost**, the participant P13 commented that *"it is worth making the developer realize how beneficial it is to contribute to the ecosystem"*.

Insight #5: *The DevRel team must support other organizational areas to reduce costs related to SECO products. To do so, it is important that the keystone shares internally with the community the role, actions and results of DevRel.*

4.3 Innovation

The identified items in the 12 comments' fragments are distributed as follows: 5 (41,6%) to Process and Transactions Restructuring, 3 (25%) to New Content, and 2 (16,7%) both to New Features and Migration. In Tables 10 to 13, we present the supplier and consumer for each element associated to innovation operationalizing items presented in the next paragraphs.

Regarding the item **Processes and Transactions Restructuring (PTR)**, practitioners' comments cover the value of DevRel as an essential area in the organizational structure, which helps the organization to focus on costs and also on the organization's maturity.

"You need to focus on the cost." - P16

"... the maturity of the company, the maturity of the product, the amount of adoption you are gaining in the community, this will change your strategies and shape the way you think about things." - P27

"It is completely necessary for the development team, for the project managers, for the daily actions and mainly for the delivery of the product." - P6

Insight #6: *It is important for the organization to restructure processes that favor the platform opening at the level desired by the organization towards the knowledge sharing. It can help the improvement of processes that involve products around SECO platforms.*

The DevRel area directly impacts the developer experience (i.e., the expectations and perceptions generated from the use of ecosystem products). Moreover, DevRel generates revenue through the use of services and helps with brand recognition. So, it should be inserted strategically as part organization's business.

"(...) are a market entry strategy, the developer's experience is a function of the product and should be measured as a business unit." - P29

"Generating revenue through the use of your service or perhaps it is implied because you are creating brand awareness for some." - P16

Table 10. PTR - Suppliers and Consumers.

Element	Supplier	Consumer
Focus on Costs	DevRel	Keystone
Organization Maturity	Keystone	DevRel
Community of Experts	DevRel	Keystone Developer DevRel
Developer Experience	Keystone Developer DevRel	Developer
Use of Services	Developer DevRel	Keystone
Brand Recognition	Developer	Keystone DevRel

Regarding the **New Content** item, the comments explore the availability of free content to developers, new contributions from developers to the ecosystem and new services for developers that are generated from their engagement.

"The content can be provided to developers at no cost to them." - P22

"Deliveries produced by developers participating in a program." - P10

"People are now consuming more of their operating system, which is generating more services." - P16

In relation to the **New Features** item, the value aspects are related to the contribution to existing products, contributions from extensions to free and paid products. It can support the development of derived products.

"... deliveries produced by developers participating in a program." - P10

"Someone buys your product and then it develops ..." - P21

Table 11. New Content - Suppliers and Consumers.

Element	Supplier	Consumer
Free Content	DevRel	Developer
New Contributions from Developers	Developer	Keystone Developer DevRel
New Services for Developers	Keystone DevRel	Developer

Table 12. New Features - Suppliers and Consumers.

Element	Supplier	Consumer
Derived Products	Developer	Keystone Developer DevRel

Regarding the Migration item, the participant P15 mentioned that it related to have active developers in the ecosystem. The active developers are starting their participation in a SECO. So, they are involved in an onboard phase. The participant P22, as described below, mentions new opportunities that allow the developer to advance within the ecosystem.

“Helping them to create businesses that take advantage of the opportunities that exist in our technology” - P22

Table 13. Migration - Suppliers and Consumers.

Element	Supplier	Consumer
Active Developers	Developer	Keystone DevRel
New Opportunities	Keystone DevRel	Developer DevRel

Insight #7: *The DevRel team must have the vision to breathe the innovation required to the developers’ contributions. DevRel should also make it easier to leverage the combination of features that become innovative SECO products.*

4.4 Complementarity

The identified items in the 11 comments’ fragments are distributed as follows: 5 (45,5%) to Products and Services, 3 (27,3%) para Activities, 2 (18,2%) to Technologies, and 1 (9%) to On-line e off-line resources. In Tables 14 to 18, we present the supplier and consumer for each element associated to complementarity operationalizing items presented in the next paragraphs.

Regarding the Products and Services item, the practitioners’ comments cover the financial investment of the developers in the resources offered by DevRel team and by the organization’s products/services. It can provide Accurate information about SECO roadmap so that developers can tailor their needs.

“It’s about the developers’ return and the investment with more money on their part.” - P21

“They are excited to be associated with someone who provides them with accurate information about their needs in relation to a company’s product launch.” - P28

The scenario presented above may allow us to understand what the organization expects from the DevRel area and the developer community. Open source products were also mentioned as a value. Another aspect addressed refers to data generated by the use of products and services to understand what developers want and how they use ecosystem resources.

“Data on how well our product does, what people want, open source developers. You just want people to use things so that you can show that you have value.” - P27

“The most important step for anyone who is a DevRel professional is to really understand what your company expects of you and what it is that you can bring to your community.” - P17

Table 14. Products & Services - Suppliers and Consumers.

Element	Supplier	Consumer
Financial Investment by Developers	Developer	Keystone Developer DevRel
Accurate Information about SECO Roadmap	Keystone	Developer DevRel
Open-Source Products	Keystone	Developer DevRel
Data Generated by Use of Products and Services	Keystone	Keystone DevRel

Regarding the Activities item, the analysis of practitioners’ interview data covers the balance for actions with different types of developer communities.

“It is about balancing the needs of reaching out to developers and working with the free and open source developer communities.” - P17

Another perception of value and activities is to contribute to other products in the ecosystem. The DevRel team still connects developers in a scalable way to ecosystem products.

“The idea is that you create users for some other product through a DevRel strategy” - P21

“It connects developers to the product in a scalable way.” - P11

Regarding the Technologies item, the comments indicate the combination of technologies from a SECO in the contributions of the developers. This fact creates differentiation for the market by attracting users and creating niches within the ecosystem. As such, developers increase their reputation by creating new and competitive products in a highly competitive environment.

“Encourage developers to use their technologies to deliver users to you.” - P21

“Developers are noted for betting on the use of new technologies to create new products.” - P28

Table 15. Activities - Suppliers and Consumers.

Element	Supplier	Consumer
Balanced Actions	DevRel	Developer DevRel
Contribute to other Products	Developer DevRel	Keystone Developer DevRel
Scalable Connection between Developers and SECO Products	DevRel	Developer

Table 16. Technologies - Suppliers and Consumers.

Element	Supplier	Consumer
Combination between SECO's and Developers' Technologies	DevRel	Keystone Developer DevRel
New and Competitive Products	Developer	Keystone Developer DevRel

Regarding the *Online and offline resources (OnOffR)* item, the participant P21 argues that the value of DevRel is in providing accessible content that allows the production of new contributions: “To make sure that there is content for people to find. And by providing APIs that allow the developer to add a contribution.”

Table 17. OnOffR - Suppliers and Consumers.

Element	Supplier	Consumer
Accessible Content	DevRel	Developer DevRel

5 Related Studies

Hyrnsalmi *et al.* [20] employed Amit and Zott's framework to identify various value sources in mobile application ecosystems. The level of analysis is focused on application considered as products, not services. The results show that efficiency is the main value driver that developers use in their value creation. The Complementarity had small value driver impact from the developers' viewpoint.

Cristofaro [21] analyzed 2,250 mobile applications to extract a business model. The level of analysis is also focused on mobile application. In Amit and Zott's framework [20], among the value sources, only efficiency, lock-in, design, and the design of added monetization were found to be statistically significant for app value creation.

In SECO field, value creation requires more industrial studies to increase and enhance the body of evidence in the field [27] [28]. De Souza *et al.* [29] and Steglich *et al.* [5] also argue that

evangelists (i.e., a member of DevRel team) are at least discussed in the literature as a SECO element. It is unclear how relationship between contributions in terms of strategy and business goals can leverage the value creation in SECO [30][31].

In our study, the level of analysis is focused on DevRel practitioners. Our results contrast with developers' and apps' perspective because *Retention* is analyzed as the main value driver. The *Complementarity* as in Hyrnsalmi *et al.* [20] study is also small value driver.

6 Threats to Validity

The first threat relates to the number of participants. As we got 31 interviewees, we cannot generalize our results to all DevRel practitioners context. Therefore, there is still a need of expanding this research by including a larger number of participating practitioners.

Another aspect involving the qualitative data analysis is that it is not possible to use statistical arguments for generalization of any results. However, it is important to stress that the participants had roles in which they could use their expertise to assess the perception about value creation in DevRel.

The third threat refers to the subjectivity of the data classification, since the qualitative analysis that was performed. We used the thematic analysis procedure to mitigate such threat. The researchers have large experience in SECO and qualitative data analysis.

7 Conclusion

The role of third-party developers changes the traditional development management strategy. The organization does not have complete control over a developer. They can leave the SECO at any time (taking information with them) or enter (requesting information). Then, the understanding of a set of items that helps in operationalizing the retention value source between developers and keystone helps to engage developers and the organization to achieve its goals. In this context, value creation in DevRel focuses on developer retention and involves mechanisms to support win-win relationships between a thriving developers' community and an organization aiming to insure/monitor developers' social welfare.

As future work, we are investigating other value sources as indicated by Amit and Zott: efficiency, complementarity, and innovation. As such, we can move forward in establishing a set of items that structure value creation in DevRel. Another work is to perform an alignment between DevRel's perspective and the work of Hyrnsalmi *et al.* [4] about value creation from the perspective of app developers. This value structure will allow practitioners, for example, to analyze DevRel's ROI (Return on Investment) and the scientific community to operationalize DevRel and SECO value creation analysis. This can be done by using software repository mining strategies and machine learning.

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