

A Framework for Software Ecosystem Governance

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Abstract. Many software producing organizations do not know how to measure, compare, and analyse their governance policy in software ecosystems. Without sufficient insight into governance, these organizations cannot optimally perform as keystone players. This paper outlines a framework for the analysis of software ecosystem governance for individual companies. With such a framework, software producing organizations can gain strategic advantage over other organizations, in that they can analyse and improve their software ecosystem governance in a structured way, leading to better ecosystem performance and health.

Keywords: Software ecosystems, governance, IT governance.

1 Introduction

Software Ecosystem (SECO) governance can help a company achieve its goals, make better use of available resources and can ultimately lead to an increase in revenue and lower risks. However, since it is a relatively new field, many organizations do not know how to effectively manage their SECO, or how to make their SECO explicit to begin with. Proper formalization for SECO governance is lacking and there are many challenges to overcome for software vendors in regard to SECOs [7].

This analytical research, based on two case studies, is an attempt to help formalize some of these challenges an organization has to overcome when formalizing SECOs and the governance strategy affiliated with the SECO, which differs from traditional ways of partner management [6]. Specifically, this research attempts to formalize a number of aspects related governance structure, such as responsibility [9] and measuring effectiveness [5].

Jansen et al. define a SECO as **a set of businesses functioning as a unit and interacting with a shared market for software and services, together with the relationships among them** [7]. Bosch [1] defines a SECO as a system consisting of the set of software solutions that enable, support and automate the activities and transactions by the actors in the associated social or business ecosystem and the organizations that provide these solutions.

These definitions are very similar, except for the level of abstraction. Where Bosch defines the elements in the ecosystem as software solutions, Jansen et al. maintain some abstraction by taking businesses as the atomic entity of which ecosystems are made up. For this reason, in this report the definition of Jansen et al. is used.

This paper continues in section 2 with the research approach. Section 3 goes into detail about governance, section 4 discussed the SECO Governance Analysis Framework. Section 5 describes the conducted case studies, section 6 presents a comparison between the organizations and in section 7 conclusions are drawn.

2 Research Approach

The research problem that was identified is that there is no de facto standard in terms of SECO governance modelling. In fact, the definition of “SECO governance” in itself has seen many different interpretations. With more formalization and a larger amount of case studies to base theorems on, researchers can begin to formulate ways for organizations to govern their SECO in an effective, efficient and profitable way.

In order to build the framework a literature study was done to compose a list of different governance tools, and structural components associated with governance strategy.

Subsequently, two case studies were conducted, to find out to which degree two real-life organizations currently employ governance, if this governance is formalized and made explicit, who is responsible for governing the ecosystem, et cetera.

Based on these case studies the framework was evaluated and modified. The studies were done in three steps: firstly, a description of the case was made from an observational point of view. After that, key persons at the companies were interviewed. In these interviews assumptions were validated or denied and new information was revealed. Lastly, information derived from the prior steps was summarized and conclusions were drawn.

The interviews were conducted with two managers, both of which have at least 8 years of experience within software companies. Both interviews took two hours and cases were selected because of company size and accessibility. The first segment of both interviews consisted of a set of pre-defined questions, so that assumptions based on the literature study could be verified or modified in a pragmatic way. The second segment was unstructured, in order to give the interviewees the opportunity to provide new information and elaborate on decisions and policies.

3 Governance

To be able to define SECO governance, the definition of the broader concept of governance and specifically corporate governance must first be made clear.

Merriam-Webster’s dictionary defines governing as “to exercise continuous sovereign authority over; especially: to control and direct the making and administration of policy”. Governance is present in every aspect of society, from governing a multi-country body such as NATO, UN or EU to the governing of one-person businesses. Any foundation, organization, body or corporation of any size that has any type of decision to make has to deal with the act of governing at some point in time.

This implication leads to a sub-definition of governance, specifically aimed at business organizations. Sir Adrian Cadbury first defined corporate governance as “the system by which companies are directed and controlled”, as to not exclude all the external elements involved [2]. However, recently, more detailed and specific definitions are being used. The Organisation for Economic Co-operation and Development (OECD) endorses the following definition for corporate governance: “Procedures and processes according to which an organization is directed and controlled. The corporate governance structure specifies the distribution of rights and responsibilities among the different participants in the organization – such as the board, managers, shareholders and other stakeholders – and lays down the rules and procedures for decision-making”. This definition was coined in the European Central Bank’s annual report for 2004.

There are a number of keywords in the ECB’s definition. First, governance implies direction and control. Both of these are executed in an on-purpose fashion. This means that governance is not something that just happens; it is something that is actively pursued and controlled. Secondly, it specifies the distribution of rights and responsibilities among different participants. This means that corporate governance is not just a definition regarding processes, rules and procedures, but it also defines who is responsible for which part of any decision that is to be made within an organization.

Some research has already been done in the attempt to formalize governance approaches specifically within software development organizations. Two notable examples are ‘agile software governance’ by Qumer [9] and ‘software development governance’ by Chulani et al [5]. While Qumer’s model focuses on maximizing business value by the business alignment and application of agile software development methods, Chulani’s model helps software development organizations to achieve their strategic goals by establishing the structural component and measurement component of governance [4]. However, neither of these models goes into detail about SECO governance in specific.

The definition of SECO governance I use for this research is: “Procedures and processes by which a company controls, changes or maintains its current and future position in a SECO on all different scope levels”. Please note that Jansen et al. [7] discuss three scope levels in software ecosystems, from the software supply network level (a company, its customers, and its suppliers), to ecosystem (the complete ecosystem), to ecosystems (where ecosystems compete amongst each other).

This definition fits right into Qumer’s ‘Agile responsibility, accountability and business value governance model’. It can be seen as a small but significant part of the ‘integrated agile governance’ aspect of an organization.

Similarly, the definition can be seen as a small, SECO-only version of Chulani et al’s ‘control and measure mechanisms’ as brought up in their 2008 paper. This model illustrates the different relationships between governance, strategy, management structure and processes.

There is a difference between governance and governance structure. The definition for SECO governance used in this paper only refers to the processes and procedures involved. The SECO governance structure, however, refers to the distribution of rights and responsibilities among the stakeholders associated with the software vendor, and the rules and protocols that need to be followed in order to make decisions regarding the SECO.

4 The Software Ecosystems Governance Framework

In order to compare SECO governance and governance structures, a framework must be developed. The governance segment covers processes, procedures and tools used to execute governance strategy, and the governance structure segment covers responsibility, control and measurement associated with governance strategy.

In terms of SECO governance, there are a number of governance tools that an organization may use in order to maintain or change its position within an ecosystem.

For example, an organization can create a partnership network in order to expand its SECO, or to make it more explicit. There are varying degrees in which governance is involved. For example, a way of governing a partnership network would be to moderate the network, to set up rules and processes to which partners must adhere and to penalize or remove partners who fail to comply. Other governance tools associated with partnership networks are the procedures involved in acquiring new partners, the degree of division within the network itself (does it consist of layers, tiers, levels, etc?) and defining the entry requirements a potential partner must meet [8].

Contribution to other ecosystems can be manifested in several different ways. For example, there is the setting up of new suppliers, ceasing operations with current suppliers, changing the ratio by which current suppliers are used and ceasing cooperation with current customers. All of these decisions do not only affect the company's own ecosystem, but the ecosystems of the associated supplier/customer as well.

Other than these two major governance tools, there are a number of other tools that can be used. An organization can choose to create a development standard or even go as far as to enforce this development standard on its partners. It can also opt to create licenses that can be reused by other actors in the ecosystem.

In making the SECO governance of a software developing organization explicit, several questions have been defined within the framework. The framework thus consists of the following parts: explicitness of both of the ecosystem itself and of the associated governance strategy, the responsibility, measurement and degree of knowledge sharing. Please find the full framework in Table 1. This table has been annotated with the case study results for reasons of brevity.

Explicitness of the ecosystem - These questions relate to the explicitness of the SECO in general. These are vital questions to the potential success of an ecosystem, because without making the ecosystem explicit, there cannot be an explicit governance strategy.

Explicitness of the governance strategy - These questions relate to the explicitness of the governance strategy. With an explicit governance strategy, organizations are able to refer to rules, procedures, protocols and formalized processes when dealing with an ecosystem, which leads to more control over the position in the ecosystem. This ultimately leads to more potential benefit gained from the ecosystem.

Responsibility - Responsibility is an important factor in ecosystem governance. Without appointed members of the organization being responsible for the ecosystem, correct execution of the governance strategy cannot always be guaranteed. Ecosystem

governance could easily become “just a job on the side”, being snowed under by the member’s/members’ main tasks.

Measurement - In order to determine the organization’s benefit from its ecosystem, the ecosystem effectiveness must be measured. This can be done by applying various key performance indicators (KPIs) to specific aspects of the ecosystem. Analyzing the current state of the ecosystem and prospecting the future state can lead to higher return on investment.

Knowledge sharing - Knowledge sharing is not necessarily a vital aspect of a successful governance strategy. For a for-profit corporation, sharing knowledge of the ecosystem is, in many cases, effectively similar to shooting oneself in the foot. For a not-for-profit organization, however, sharing knowledge may actually be an aspect of core business.

Based on the aforementioned ecosystem governance tools and the questions that arise when discussing governance structure, a framework can be used to compare SECO governance strategies.

The framework consists of an upper half that is filled in with concepts related to SECO governance, and a bottom half that is filled in with concepts related to SECO governance structure. Furthermore, the bottom half is sorted by category, in order to provide a good perspective of the current state of affairs within an organization in regard to a certain aspect of SECO governance structures.

The framework is filled in by adding empirical data to each concept. This is either in the form of yes or no, or an elaboration in natural language. For example, the concept ‘Creating reusable software licence(s)’ can be answered with yes if the specific company does indeed create a reusable software licence.

A more specific concept, such as the degree of moderation of an active user group, requires explanation in natural language, rather than a yes or a no. This can be done by providing a short explanation together with the framework, and noting a statement in the explanation that concerns a question in the framework with (1), (2), (N). The question can then be ‘answered’ in the framework using the same notation.

With this framework, organizations are able to get an overview of the state of their current SECO governance strategy. Researchers can compare different companies with each other, and, based on best practice, derive which parts of strategy are viable and which ones are not [3]. Ultimately, this will lead to a better understanding of practice and thus more theoretical completeness. As for the business side, a better understanding of SECO governance will lead to better control over one's SECO, thus eliminating risks and increasing profitability.

5 Case Studies

In this part of the report the case studies performed on UNIT4 and the Eclipse Foundation are described. These case studies were conducted in the form of unstructured interviews.

UNIT4 N.V.¹ is a Dutch software company that mainly provides enterprise software and related professional services. Its headquarters are located in Sliedrecht, The Netherlands. In 2010 the company employed 4,200 FTE and its total revenue was just over €420 million. The company's best-known products are Agresso Business World ERP Suite and Coda Financials.

Several significant acquisitions have taken place in recent history. The first one of these took place in 1998, when UNIT4 took over three companies with significant market share in the health care and wholesale sectors. In the beginning of the new millennium UNIT4 took over Agresso, a Norwegian software company, which was the company's first major step towards internationalization. In 2006 Spain was added to the list by a number of local takeovers, and in 2008 the biggest takeover in UNIT4's history was realized when CODA became a part of the company.

UNIT4 does not have any formalization regarding expanding the company. The ultimate goal when planning an acquisition is always to increase the company's scale of operations and to become or remain a top 3 player in a specific sector. However, this is usually realized by taking relatively small steps. The ultimate responsibility for acquisitions lies with the Board of Directors of UNIT4 international.

The significant acquisitions from the past can be divided into two different categories: takeovers of companies with knowledge of sectors in which UNIT4 is not present (enough), and takeovers of companies in countries where UNIT4 is not operating (significantly).

An example of acquiring a company from a new sector is the takeover of Aceso, which allowed UNIT4 to expand its business into the accountancy and health care sectors. The greater idea behind acquiring a company, rather than setting up UNIT4 in a new sector, is that the added benefit of (potential) customers being familiar with the already active company is of great importance. The decision to actually acquire another company is based on the market share this company has, the return on investment (ROI) involved, and the technology that the company possesses.

On an international level, UNIT4 depends on several suppliers. These include major enterprises such as Microsoft and Oracle, but also smaller companies such as the hosting companies that run the Software-as-a-Service (SaaS) solutions UNIT4 provides.

UNIT4 recognizes that it is important for a company of its size not to be dependent on only one supplier, to prevent any supplier from being 'too influential'. However, again, this is not formalized in any documentation or rule set.

The organization has created user groups, in order to provide opportunities for UNIT4 software users to share experiences and ideas to improve their understanding and use of the UNIT4 solutions. The groups organise workshops, meetings and social events around shared interests.

To sell its products to medium and small businesses in The Netherlands, UNIT4 has contracts with several local resellers who are each assigned to a specific region within the country. This is the only partnership model UNIT4 currently uses.

Reseller contracts are renewed yearly and, based on market analysis performed by UNIT4, have formal goals in terms of new customers, licenses sold and total revenue

¹ UNIT4 NV, www.unit4.nl

generated. If these goals are met, the reseller gets a higher discount on UNIT4 products in the next year (thus increasing its own margin and therefore profit). In 2009 most of these targets were not met due to the global financial crisis, and many resellers lost a percentage of their margins when the 2010 contracts were signed. New resellers are acquired based on the market share and the amount of potential customers in certain areas of the country.

One can conclude that UNIT4 is not yet in a mature phase when it comes to SECOs and SECO governance. Currently, governance takes place at the very top level of the organization when it comes to decisions that are going to affect the company's core business internationally, and at the highest level of a national branch of the organization when a decision is only going to affect the activities in that specific country. However, none of this is actually formalized. The SECO is not explicit and there is no formal documentation describing policies or protocols. Inherently, there is no formalized documentation about SECO governance, either.

The company does use one of the listed governance tools: the creation of a partnership network. As discussed in an earlier paragraph, UNIT4 has contracts with several Dutch resellers who are each assigned to a specific region within the Netherlands. However, there is very little formalization when it comes to partnerships, other than the reseller contracts that are being renewed each year.

There is a very low degree of moderation. If a reseller does not manage to sell the target amount of products, this is essentially 'their problem' and UNIT4 will renegotiate the contract or even terminate it, but there are no moderation tools being used while a contract is still running (1).

UNIT4's partnership system does not have a division in tiers or levels. Every reseller is the same, except for the contracts that are being signed. Goals are defined based on "what seems realistic", based on analyzing previous results and doing extensive market research (11). These goals are also used as a measurement tool, to see if the reseller manages to sell the target amount of products (9)(10).

Acquiring new partners is a vital aspect of UNIT4's partnership strategy (2). However, the acquisition of a new reseller is done by 'gut feeling'. If market share is lacking or dropping in a specific area of the Netherlands, potential candidates are being selected based on having affinity with IT reselling, and interviews are conducted. Based on those interviews, a winner is selected. There is no protocol or documentation for this procedure.

The effectiveness of the ecosystem in itself is not measured, other than the effectiveness of the partnership system, and contributions to other ecosystems are not coordinated. The sub-attributes of contribution coordination (new suppliers, ratio, ceasing cooperation) are in fact used, but again without any formalization (3)(4)(5). Also, there is no form of a reusable software license created by UNIT4. However, the organization does host User Groups in which users are invited to share experiences, join workshops and increase their understanding of UNIT4 business software. These user groups are moderated extensively, with UNIT4 answering questions in a knowledge base, organizing meetings and workshops, and handling questions and feedback (6).

Lastly, knowledge on any of the aforementioned attributes is not shared with other companies within the ecosystem.

The Eclipse Foundation² is a not-for-profit organization whose projects are focused on building an open development platform comprised of extensible frameworks, tools and runtimes for building, deploying and managing software. Originally founded by a consortium of IT companies in 2001, Eclipse now is a stand-alone corporation with 40 staff employees around 950 dedicated developers.

All of Eclipse's products are free to use under the Eclipse Public License, which is approved by the Open Source Initiative. Many of the member companies have dedicated programmers working with Eclipse code. Out of the roughly 950 dedicated developers, 800 are not actually employed by the Foundation but by member companies. This results in a highly knowledgeable community of developers with varying personal and corporate interests, allowing the Eclipse platform to be expanded in many different directions.

Currently Eclipse has a variety of products available, for example an integrated development environment (IDE) for Java developers, a PHP development environment and a collection of modelling tools.

The Eclipse ecosystem is explicit. This can be seen through various instances, like the Eclipse Plug-in Central (EPIC), Eclipse Live, the Eclipse Membership model and EclipseCon.

There is a very distinct difference between companies with a membership model such as Eclipse, and companies with a partnership model such as UNIT4 or Microsoft. The latter implies that there is a keystone company and a dominator company, where one company has a lot of influence over the other. This is not the case with Eclipse, where a membership model is used to 'help members help themselves'. The members themselves are the ones who set up the rules, as opposed to a traditional partnership model where the company with the model decides everything. Reselling and whitelabeling are allowed, but a partnership model for this is not needed because the Foundation is not-for-profit.

The Foundation has a five-tier membership model with a very large member base, consisting of many different IT companies like Motorola, IBM, Oracle and Nokia. Each membership type has different privileges and different obligations. Since many of these companies provide the developers that develop Eclipse projects, one could say that the Foundation uses its members as suppliers. However, the members are also customers, because they use the Foundation's benefits to strengthen their own products or services.

The plug-in central is a marketplace-like platform where everyone can contribute with any kind of plug-in or add-on for Eclipse. This can be seen as an ecosystem in itself: the suppliers are the people who write extensions for the platform, and the clients are the people who then download and use the products.

The Eclipse Foundation also facilitates so-called Industry Working Groups or IWGs. These are established to facilitate the collaboration between their members. The collaboration should be intended to focus, promote and augment Eclipse technologies to meet the needs of specific industries. This can be done in the form of developing materials for a specific community or joint marketing programs to promote Eclipse in a specific industry. Unlike Eclipse's open source projects,

² Eclipse Foundation, www.eclipse.org

participation in an IWG is only open to Eclipse members. There is some governance involved; for example, all code content must be developed as part of an open source project, and any third party content used by an IWG must be submitted to Eclipse under the Eclipse terms of use.

The Eclipse Foundation feels that all of the separate Eclipse projects should be governed by the people who are working on them. Because Eclipse is an open source, not-for-profit platform, there is no profit goal to which the ecosystem should be directed. There is no coordination from inside the Foundation, there is no council of directors telling the individual project leaders what to do and how to do it. The membership system is largely governed by itself. In fact, the Eclipse ecosystem has produced innovation in areas where the Foundation did not expect it.

The other community services Eclipse provides, such as Eclipse Live and the Eclipse Plug-In Central require very little governance as well. For example, the only requirement for plug-ins to be added to the Plug-In Central is “it has to work with Eclipse”.

The Foundation measures its effectiveness through a number of key performance indicators (KPIs). These are, for example, measuring the growth of membership to see if the ecosystem is developing in the way the organization had in mind. Because of the organization’s not-for-profit profile, there is no way of measuring effectiveness by conventional KPIs such as return on investment (ROI).

The first obvious conclusion that can be derived from the case study is that the Eclipse Foundation is in an advanced stage of ecosystem maturity. The organization has a very explicit ecosystem with four people who are responsible for managing the ecosystem and applying its governance. These are situated directly under the Board, with one of the Ecosystem Directors working with the Foundation full-time (8)(9).

Furthermore, the ecosystem is fully documented and formalized, and there are a number of protocols for many situations, such as application procedures for new members, roadmaps for future development, etc. To a degree, there is a formalized way of translating Eclipse’s business strategy to a SECO strategy. The idea behind the Foundation is that it serves as a not-for-profit platform to ‘help members help themselves’, and the SECO is designed with this philosophy in mind (5).

An important factor about the Eclipse ecosystem is that its effectiveness is measured in an objective way. The Ecosystem Directors for the different regions have a number of KPIs by which they can see how well the ecosystem is performing. Some of these KPIs include amount of new members joined, amount of members who do not renew their annual membership and amount of downloads from the Eclipse Plug-In Central (10)(11). Goals are defined based on the results achieved in previous years and continuous market analysis (12). Furthermore, the acquisition of new members is governed in a very light sense. Only organizations where ethical questions might pose a problem are screened, but other than that, every organization is welcome as long as it follows the rules the Foundation has set up (2).

There is not a very high degree of governance within the membership system (1)(5). Most of the tiers that are active now were set up when the membership system itself was set up. Over time, two extra tiers have been added. These tiers each have separate entry requirements (3), but other than that, the system pretty much governs itself. This is mainly because Eclipse is not-for-profit and there is no ‘greater

goal' for the Foundation other than to serve its members. Within reason, there is no real reason not to let members do as they please to help each other and themselves.

Another important governance tool is the creation of a reusable software license. Eclipse uses the Eclipse Public License (EPL) for its software. This is an Open Source Initiative-approved free software license.

Finally, since the Foundation is completely open source, any knowledge shared by a member within the ecosystem can and will be shared with the other members (4). For knowledge sharing, Industry Working Groups are a very effective tool. These groups can also be seen as active user groups, but with a goal greater than just 'delivering feedback'. Once again, there is no real reason for a lot of governance or moderation within these groups, because members are supposed to help each other help themselves (6).

6 Comparing the organizations

In analyzing the two organizations, the following observations can be made. First of all, it is not a big surprise that the closed source, for-profit software vendor does not share any knowledge about the ecosystem, and that the open source, not-for-profit organization does. It is worth mentioning that the two organizations can be seen as Raymond's cathedral and bazaar [9], albeit a closed-source cathedral. Within Eclipse, all of the processes are publicly available, all the documentation can be viewed by everyone and software can be resold by anyone, much like Raymond's bazaar where code is developed in a bottom-up way. On the other hand, code is developed from a top-down perspective within UNIT4, where the majority of revenue is generated through maintenance and support. This is much like a closed source version of Raymond's cathedral. Software vendors traditionally employ a top-down oriented approach, in order to have full control over every aspect of the organization. Because of this, it is strange to see that a potentially profitable area such as SECO governance has been left untouched so far.

A similarity can be found in the creation of a partnership network (or membership network in the case of Eclipse). Both vendors seek to bind other organizations to them, in order to achieve their own business goals. In the case of UNIT4 the goal is simple: more profit. Resellers are contracted in order to increase revenue generated through licenses. In the case of the Eclipse Foundation, the goal is to serve as a platform where members can help each other and themselves.

The degree of how vital the network is to the organization is very different, though. Without UNIT4's partnership network, the amount of revenue generated would decrease, but not by a very significant amount. The company would still be able to perform its core business in an effective and profitable way. However, as for the Eclipse Foundation, without the membership network a very important aspect of the organization would cease to exist. Facilitating an ecosystem is part of the company's core business, rather than 'just something to get a little more revenue'.

7 SECO Governance Analysis Framework

Framework for SECO governance strategy	Category	SECO Governance concept	U4	Ecl
	Partnerships	Creating a partnership network Degree of moderation Degree of division in tiers, levels, etc Acquiring new partners Formalization of entry requirements	Yes (1) No (2) No (3)	Yes (1) Yes (2) (3)
	Supplier and customer governance	Coordination of contribution to other ecosystems Setting up new suppliers Changing the ratio of current suppliers Ceasing cooperation with suppliers or customers Using intermediaries	Yes (3) (4) (5) Yes	(4) No No No No
	Development	Creating a development standard Enforcing a development standard	No N/A	Yes Yes
	Partner directory	Creating a partner directory Degree of moderation	No N/A	Yes (5)
	Customer directory	Creating a customer directory Degree of moderation	No N/A	No N/A
	User groups	Creating active user groups Degree of moderation	Yes (6)	Yes (6)
	License(s)	Creating reusable software license(s)	No	Yes
	Category	SECO governance structure concept	U4	Ecl
	Ecosystem explicitness	Is the SECO explicit? Is there documentation describing its current state?	No No	Yes Yes
	Governance explicitness	Is the SECO governance strategy explicit? Are processes and procedures formalized? Are there formalized and documented rules? How is business strategy formalized to governance strategy?	No No No N/A	Yes Yes Yes (7)
	Responsibility	Where in the organization does SECO governance take place? Who does the decision making unit consist of? Is this decision making unit made explicit? Does the decision making unit report to the Board?	(7) (8) No Yes	(8) (9) Yes Yes
	Measurement	Is the effectiveness of the SECO measured? Which parts of it are measured? Which KPIs are used? How are goals defined?	Yes (9) (10) (11)	Yes (10) (11) (12)
	Knowledge sharing	Does the organization share its knowledge with other companies?	No	Yes

Table 1. SECO Governance Analysis Framework

7 Conclusions

This research has provided a basic framework by which SECO governance and SECO governance structure can be analyzed. In order to extract all the data required to fill in the framework, in-depth interviews with companies must be held.

It is too soon to consider this framework as a ‘set in stone’ basis for everything SECO governance-related.

It is important to realise that the framework can be used to describe, analyze and compare SECO governance policies, but it does not in fact dictate the importance of individual factors. For example, knowledge sharing may not always be desired, and an organization can have a very mature SECO governance policy while deliberately not sharing any knowledge within its SECO.

The first and foremost limitation of this research is the lack of expert reviews to validate the framework presented. Expert reviews are needed to verify the accuracy of the model, and, in order to adopt this model for future research, four to six experts who work with software ecosystems on a daily basis need to edit and eventually approve this framework.

Another one of the limitations for this research is the quantity of case studies. Two case studies are not enough to allow for any deduction of theorems. While the current framework is a solid basis upon which further research can be carried out, more case studies are needed to confirm or deny the differences and similarities that this research points out.

8 Future Research

As stated in the previous segment, more case studies are required to allow for formalization of software ecosystem governance. The basis for this research is relatively thin and with more researches similar to this one, theorems could be derived, tested and approved. This would transform the field of SECO governance from analytical, where researches study ‘best practices’, to a situation where organizations take established theorems into account when developing a SECO governance strategy.

In general, however, the field of SECO is a relatively new one and more research on for example SECO modelling, business strategies versus SECO strategies, the architectural and social implications of SECOs, and SECO optimization is required. With the development of the International Workshop on Software Ecosystems (IWSECO) and its association with the International Conference on Software Business (ICSOB), a solid platform for future research is established.

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