

Creating a Method for Modeling and Analyzing Coopetition in Software Ecosystems

Andrey Krupskiy
Faculty of Science, Utrecht University

Supervised by
Dr. S. Jansen
Assistant Professor, Faculty of Science, Utrecht University

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Abstract

OBJECTIVE: Coopetition in software ecosystems is a commonly encountered phenomenon that does not have standard methods for modeling. The goal of this research is to increase the body of knowledge in the modeling field applicable to Coopetition in SECO.

METHODS: First, the literature study of the existing methods is performed. Next, best suiting modeling techniques for describing the coopetition in SECO are chosen. Afterwards, the guidelines for each modeling technique are compiled. Finally, the models are created following the guidelines and the guidelines are evaluated based on the modeling experience.

RESULTS: The results are a set of models: i^* , game trees, and e3value models. i^* model serves the purpose of giving an overview of the whole situation within the SECO. Game trees model allows to create a set of scenarios, based on the i^* model, and then evaluate each scenario from the perspective of utility yield for each actor. e3value model allows to see what values are being exchanged between the actors. Furthermore, a number of evaluations of the guidelines are given with the purpose of improving the modeling process.

CONCLUSIONS: Compiled guidelines are sufficient for the creation of the as-is models. The models used have high easiness of use, require little time to learn and can give an overview of the coopetition within SECO. With larger models, readability becomes lower, however a number of recommendations are given on how to overcome this problem. Furthermore, this research makes a step towards the further formalization of the models to provide more accurate coopetition overview.

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Chapter 1

Introduction

Software Ecosystems (SECOs) is a young field of study originated between 2005 and 2007 [1] that looks at companies developing software, their products, customers, and other related actors and products as a whole. There are several definitions of SECOs in the academic community, one of them being "A set of businesses functioning as a unit and interacting with a shared market for software and services, together with the relationships among them" given by S. Jansen et al [2].

Modeling of SECOs is also a young discipline that lacks standard methodologies. However, there are several approaches to model companies involved in the software market and their relations. Those approaches vary depending on what is being modeled, what is the desired level of granularity and what is the expected outcome of the modeling activity. There exists a number of approaches to visualize a SECO, such as a power perspective [3], actor-network theory [4], and Software Supply Network [5].

i* is a modeling language that focuses on intentional, social, and strategic dimensions [6]. This makes **i*** a good choice for modeling SECOs, since it allows for the capturing of both the goals of the companies, and the relationships between these companies. **i*** technique can be expanded further to accommodate the need to show the desired goals of the actors, the dependencies they have on each other, and the order in which those goals need to be completed. Such expanded technique is demonstrated in the work of V. Pant and E. Yu[7]. On top of **i*** modeling, game trees approach can be used to show and calculate the possible outcomes for all actors involved, depending on what goals they decide to pursue [8]. Furthermore, e³value modeling technique can be used to create a model that would show the activities during

which the actors exchange things of economic value with one another[9].

Coopetition is a phenomenon of paradoxical relations between companies where they compete and cooperate with one another at the same time [10]. The nature of SECOs implies that companies are to actively interact with one another. This interaction is not limited to strictly cooperation or competition. Such a phenomenon as coopetition frequently takes place when relations between companies are being described. Gnyawali and Park [11] argue that such phenomenon has a higher likelihood of occurring in the technological field. Bengtsson and Kock [10] state that the coopetition can also occur in the environment where industries seek to increase the value of it's products through integration of external resources through networking, a typical situation for SECOs.

The coopetition modeling in SECO is further complicated by the fact that in some industries companies shift from the rigid roles where activities are situated strictly within the companies to more dynamic roles, where activities are more spread throughout interacting companies. This means that the developed method needs to take those changes over time into account as well.

The objective of this study is to increase the body of knowledge in the field of SECOs modeling by testing and improving an existing modeling method so that coopetition relations between SECO actors are shown adequately in order to allow further analysis of the SECO, it's actors, and their decisions.

The research questions of this study are the following:

Research Question 1 What is the state of modeling methods of coopetition in SECOs?

Research Question 2 What results can be yielded from the modeling of coopetition using i^* , game trees, and e^3 value models under the proposed guidelines?

Research Question 3 Can produced results be used to suggest a to-be relations in SECO where all actors increase their utility yield?

This paper focuses on the expansion of the modeling method proposed by Vik Pant [7]. The structure of the paper is the following. First, a research method is being explained in Chapter 2. Then a literature study is conducted

in Chapter 3. Next, an as-is and to-be models of a cooperative relationship in a SECO is created in Chapter 4. After that the results are being examined and potential improvements are listed in Chapter 5. This is followed by discussion in Chapter 6. Finally, conclusions and future work can be found in Chapter 7.

Chapter 2

Research method

The research method of this paper is based on the design cycle described in Design Science Methodology for Information Systems and Software Engineering [12].

2.1 Problem investigation

2.1.1 Stakeholders and their goals.

Stakeholders involved with SECOs lack easy to use modeling notation that would give an overview of a SECO so that it can help answering questions such as "What is the most optimal strategy for an actor?" and "What changes can be done to the SECO so that they benefit all actors?".

Scientists that are involved in the fields of SECOs and cooperation. Their goal is increase the body of knowledge in those fields to be able to reason better about the present and future states of the SECO. Such reasoning may concern a possible death of the SECO in the future, growth of the SECO, relations dynamics within the SECO, finding an equilibrium of what goals can be achieved out of all actors involved within the SECO. Furthermore, testing existing tools empirically would show the shortcomings of those tools and suggest possible ways to overcome them.

Companies in the SECO that want to gain more knowledge about the current situation to be able to make better decisions that would allow to improve their standing in the future. Better standing can include such goals as increasing profits, increasing market share, eliminating competitors from

the market.

Customers in the SECO that consume the product of the SECO. Their goal is to maximize the utility yield from the product of the companies in SECO over the period of time. Customers want to know the health of SECO, since dead SECO means that the product is not supplied to the customers anymore. This is the problem for the customers since switching products introduces transaction costs spent on the search and setup of the new product that would satisfy the needs of the customers.

2.2 Resulting models for SECO analysis

2.2.1 Artifact

The artifact is a collection of models that illustrate the SECO (companies, their goals, relation between all aforementioned entities) – the "as-is model". Next, an analytical part that describes the future of the SECO if no stimuli is exercised upon it. Furthermore, this part also shows what changes are to occur in the SECO if a specific stimuli is exercised. Finally, a "to-be model", where the most optimal future situation within SECO is described, as well as ways to reach it.

2.2.2 SECOs and competition

SECO phenomenon can be explained by the fact that supplying a software product to the end user is a very resource demanding task. To tackle this resource problem, the workload is being spread between a number of companies that specialize in their own area. Furthermore, an end user product oftentimes has dependencies on other software products. This creates a situation where a number of companies and other related parties interact in the pursuit of the goal of providing the end customer with the required product.

Coopetition can be explained by looking at the goals of the companies and their dependencies. Under certain conditions a company can have goals that depend on the goals of the other company. At the same time, some goals of the same company can be independent of the other company. This creates a situation where a company as a whole tries to maximize the amount of goals it satisfies, yet some goals lead to competitive behavior between companies in certain areas and the satisfaction of other goals, that depend on goals of

the other company, encourages cooperative behavior of both companies in certain areas.

2.2.3 Negative effects from the lack of modeling method

In the situation where the SECO and cooperation within it is not studied the level of uncertainty for all parties involved in the SECO is higher. High uncertainty makes decision making for the involved actors more difficult, less accurate and as a general rule actors want to increase the level of certainty. Following this logic, if no treatment is applied to the phenomena of SECO and cooperation, those phenomena would detract from the goals of all stakeholders.

2.3 Treatment design

In this section the treatment is the proposed method of modeling and analyzing cooperation in SECO. The context is a SECO and stakeholders interacting with it by participating in it, studying it or considering partaking in it.

2.3.1 Requirements and context assumptions

2.3.1.1 Functional requirements

Give an overview of the cooperation in SECO "as-is". For that, the method requires techniques that can visualize actors, their goals and relations. The relation between goals should also be shown, such as OR and AND relation. The OR relation implies that only one goal out of a set of goals can be completed. AND relation implies that all goals need to be completed to satisfy a certain condition. A technique to illustrate what values are being exchanged to satisfy goals.

Give a prediction of "to-be" situation if no stimuli from outside is applied. A technique to compare the importance of goals.

Propose an optimal situation based on a satisfaction of goals of a set of actors. A technique that allows to find a situation, where the maximum amount of goals are satisfied for a set of companies.

Propose a way to achieve such situation. A technique to add, change or subtract actors, goals and/or relations.

2.3.1.2 Quality properties

High readability even with vast SECOs. A SECO is usually a complex and vast entity with a lot of actors, goals and relations. One of the problems is that the readability of models of SECO is oftentimes low.

Fast to learn for new users. The method is being developed not only for the experts in used modeling languages (most often academics), but also for people involved in the industry, how lack extensive knowledge in those languages. The overall method and modeling languages used should be easy for new users to learn.

2.3.1.3 Assumed context

The assumed context is a collection of data describing the competition case in SECO. Such collection of data can consist out of academical literature, statements made by stakeholders regarding their products and goals, customer feedback, documentation of products. This collection of data should allow to reason about the stakeholders, their goals, dependencies and relations.

2.3.2 Contribution of requirements and assumed context to stakeholders goals

Researchers would have a method that allows better visualization of SECO and a better understanding of it in the present and the future.

Companies would receive a contribution in the form of description of their current situation, how their goals depend on the goals of other stakeholders. Such knowledge would allow the companies to make more informed decisions when it comes to achieving current goals and setting new ones. Furthermore, the results of the prediction and propositions requirements should allow companies to better understand the dynamics of their relations with other companies and the consumers. Such understanding can lead to more informed strategic decisions when it comes to completing strategic goals, such as:

- Should the company fight for the market share or leave the market?
- Should the company cooperate, compete or have competitive relations with another company?

Customers would have more knowledge when it comes to such decisions as: Should they participate in the SECO? If they participate in the SECO, the product of which company should they consume?

2.3.3 Available treatments

Case study is the first step in the method. The data on the companies, their goals, relations, customers is being collected from all available sources.

Modeling is performed based on the collected data. The modeling process starts with creating an i^* model for the SECO. This process is guided through the i^* language guide. Further, the model is being extended to satisfy the requirement of visualizing the priority of goals. Next, a game tree model is created based on the i^* model using guidelines and i^* to game trees mapping. E3value model is created next, based on the guidelines and i^* to e3value model mapping.

2.4 Treatment validation

2.4.1 Mechanisms behind the produced effect of SECO modeling

Treatment validation would be tested through single-case mechanism experiments. A model of the Amazon RDS and Microsoft products (SQL server, Azure) would be created. The model would consist out of as-is model, to-be model without stimuli and a set of to-be models with applied stimulus. Applied stimulus would depend on the requirements of the to-be model, such as: which goals need to be satisfied, which dependencies need to be held or avoided, which stakeholders are of interest. As-is i^* model and reasoning about it would provide an overview of the current situation, the roles of the stakeholders. As-is game trees model would allow to reason which decisions would be preferable by the actors, allowing to reason about the future situation if no stimuli is applied. This model would also allow to reason why certain decisions are not made by actors, thus providing knowledge to what parts of the model the stimulus needs to be applied to create a change in the to-be model. e³value model would provide additional insight into dependencies between actors. To-be i^* model would allow an overview of the SECO situation in the future.

Furthermore, experts would be interviewed to evaluate the model and the results it allows to yield. The experts would be chosen based on their academic background, such as the fields of SECO, coopetition and modeling of company relations. The results of those interviews would allow to reason how significant the results of the model are and what further improvements can be implemented.

2.4.2 Produced effects and requirements satisfaction

The effects are expected to satisfy the functional requirements of modeling an as-is model completely. To-be models with and without stimuli, as well as a proposition of an optimal situation and a way to achieve it are expected to be satisfied partially. Incomplete information about the SECO as well as imperfect techniques that allow to reason about coopetition are viewed as the biggest obstacles for this requirement satisfaction.

As for the quality properties, high readability is expected to be satisfied to the reasonable degree. The modeling techniques described in the method have high readability, so a set of them is expected to have high readability as well. The biggest threat to the high readability is the size of the models, however valuable lessons on tackling this challenge are expected to be learned during the modeling process. Being fast to learn property is expected to be satisfied, since all modeling techniques used are easy to learn on their own. The whole method is expected to be documented in a way, that expects the reader to have none to little experience with used modeling techniques.

To sum up, this study attempts to validate and improve the modeling method for SECO. Validation is done by following the guidelines compiled from the works dedicated to SECO modeling and evaluating the results: i^* , game trees, and e3value model. Furthermore, the usefulness of those models is also evaluated to an extent how much those models can help the decision making process of stakeholders such as actors within SECO, customers of SECO or researchers. Finally, a number of recommendations is given on how the modeling method can be improved so that the models can provide more accurate results.

Chapter 3

Literature study

Literature study was conducted under the guidance of the academic supervisors. A Table 3.1 shows papers recommended by the academic supervisors on specific topics.

This chapter consists out of the following sections: SECO and coopetition modeling. An overview of relevant publications in the SECO area is presented in the section 3.1. Studies of coopetition and coopetition modeling can be found in the Section 3.2

3.1 SECO

In the literature study conducted by K. Manikas [25], a new, updated definition of a SECO is suggested:” *The software and actor interaction in relation to a common technological infrastructure, that results in a set of contribution and influences directly or indirectly the ecosystem*”.

Manikas and Hansen [1] define 5 main types of actors in a software ecosystem:

Table 3.1: Suggested papers

Subject	Child paper
Background	[13, 14, 15, 16, 17, 18, 19]
Coopetition modeling	[20, 21, 22, 23, 24, 7]

- Orchestrator
- Niche player
- External actor
- Customer

Orchestrator is an actor usually in charge of keeping the SECO healthy by managing the platform. **Niche player** is an actor that participates in the SECO by creating additional components for the platform with an aim of increasing the functionality of improving non-functional properties of the platform. **External actor** is an actor that makes use of the possibilities the ecosystem provides and thus providing indirect value to the ecosystem. This actors interests can be, but not limited to, development of the platform in parallel with other actors, identifying bugs, making proposals regarding the future of the platform. **Customer** is an actor that purchases the SECO product to use it as intended.

3.2 Background of coopetition modeling using i*

The area of Requirements Engineering (RE) deals with "translation from informal observation of the real world to mathematical specification languages." [26]. Even though this research does not focuses directly on RE, the experience and best practices in that area can be used to the benefit of modeling coopetition in SECO. The methods that are of the biggest interest are those that deal with goals, soft goals and actors. Visualizing a SECO using those entities would allow to give an overview of who (actors) desires to achieve what (goals) under certain conditions (soft goals).

One of the early papers describing the rationale behind goal-oriented RE and explains why focusing on goals can be useful in RE [13]. The paper also states that in "the early stages of requirements process, it is more important to model and analyze stakeholder interests, and how they might be addressed or compromised by various system-and-environment alternatives" and further notes that i* framework was developed while taking this observation into account. Furthermore, using a goal-oriented framework improves such aspects of RE as: requirements acquisition, relating requirements to

organizational and business context, dealing with conflicts, driving design, traceability of rationales, management of change and verification of achievement of requirements.

A paper on non-functional requirements (NFR) framework, how it works and the rationale behind it [14]. The paper attempts to structure the workflow with the NFRs. The suggested steps are the following, the most important and relevant steps for this study are written in **bold**:

- Acquiring or accessing knowledge about:
 - the particular domain and the system being developed
 - **functional requirements for the particular system**
 - particular kinds of NFRs and associated development techniques
- **Identifying particular NFRs for the domain**
- **Decomposing NFRs**
- **Identifying ”operationalizations” (possible design alternatives for meeting NFRs in the target system)**
- **Dealing with**
 - ambiguities
 - **tradeoffs and priorities**
 - **interdependencies among NFRs and operationalizations**
- Selecting operationalizations
- Supporting decisions with design rationale
- Evaluating the impact of decisions

Acquiring functional requirements for the particular system would allow to show what goals need to be achieved by a system. Identifying particular NFRs for the domain aims at creating a high level NFRs that would be further decomposed. Sources such as [27] can be used as a starting point for including NFRs. Next, Decomposing NFRs is an important concept, since it allows to refine the level of granularity of NFRs. The study describes such important concept as ”AND” contribution type. This type of contribution

occurs when an NFR is being decomposed into a set of lower level NFRs that together should meet the higher-level NFR. Identifying operationalizations is a process of defining what actions need to be undertaken to satisfy the NFR operationalization is connected to, since just refining the NFR does not specify the means to satisfy it.

Dealing with tradeoffs and priorities is achieved thorough the introduction of "OR" contribution type, that means that only one operationalization needs to be completed in order to satisfy the NFR. Furthermore, normally an operationalization has a positive contribution relation with an NFR, meaning that an operationalization improves the state of the NFR. Priorities mean that certain NFR are critical for the success of the system or the organization. In the NFR framework such NFRs are marked with an exclamation point (!). Interdependencies among NFRs and operationalizations can be discovered when studying the impact of a given operationalization on NFRs it has no relations with. In some situations such operationalization can be harmful to other NFRs already present or excluded from the model, in that case a negative contribution relation is used.. It is important to evaluate each new operationalization to reduce the possible harmful effect.

Lastly, it is important to note that the steps described do not have to follow a rigid order, but should rather be taken as a set of iterative rules.

Another study conducted by E. Yu investigates the concept of an agent in requirements engineering [15]. The study examines several RE frameworks: Composite Systems Design [28] and KAOS [29] , Albert II [30] , The F3 Framework [31] and i* framework [6] . Those frameworks are studies to learn how they approach the concept of an agent. i* uses several variants of agent notions to represent different degrees of concreteness:

- agent that refers to the concrete, implementable variety
- abstract roles that can be assigned to agents
- positions that are usually used to assign a bundle of roles to a unit.

As for the goals, in i* goals always belong to agents and unlike other frameworks global goals are not used. Furthermore, goals appear in the structural relationships among agents, contrary to input-output relationships in most modeling frameworks.

Non-functional goals (also known as softgoals) are treated in the same way as in NFR framework. Softgoals appear as relations between agents and are renegotiated during the creation of the model.

i* utilizes an approach to process where the agents and process are treated in a way where agents are actively involved in making choices, but the choices and criteria are only partially available to the modeler. Furthermore, the line between the operational process (business process) and the design process (the decision making process behind the creation of the business process) is not methodologically predetermined. The operational process is described in terms of actions or activities, for example all goals have to be fully achieved. This leads to the situation where agents in the domain decide the degree to which goals need to be achieved during the design process, unresolved goals are addressed during the operational process.

Scalability wise, i* allows to define the scope of relevance via an analysis of the strategic dependencies of the actors. This allows to have a different scope of interest for each alternative solution considered during the RE process.

3.2.1 Main issues tackled by i*

Here a list of problems and ways to tackle them using i* modeling language is presented. The following list is compiled from the papers discussing some of the core concepts of i* [16, 17, 18].

3.2.1.1 Autonomy

The concept of autonomy means that agents have a certain degree of independence from the surrounding context, leading to them being independent in their decision making. This means that as an analyst, when modeling actors, none of their possible behavior should be ruled out. Thus, this approach takes into account not only uncertainty from the outside world, but also the uncertainty produced by the agent. It is a less simplistic view of the problem, however it is a more realistic one.

3.2.1.2 Intentionality

Intentionality aspect of i* allows the modelers to answer the "why?" questions when reasoning about agents. Instead of suggesting an actual behavior, the focus is on intentional properties and relationships. Such intentional ontology allows analysis of means-ends relationships and of the space of alternative for each actor. This approach allows to document goals and beliefs of actors,

thus allowing to reason what choices would be desirable for those actors when they face the uncertainty of the outside world.

3.2.1.3 Sociality

Sociality is a construct of i^* that is opposite to autonomy of an actor. The focus of i^* in terms of sociality is to show that a well-being of an actor depends on other actors. Actors depend on each other for goals to be achieved, tasks to be performed, and resources to be obtained. Following this rationale, an actor acts in its own self interest and takes advantages of the opportunities presented by other actors to fulfill own goals, tasks, etc. This leads to reciprocal dependencies and expectations on each other. An example of such can be agent A expecting agent B to deliver on a commitment because B has goals and interests that A can help fulfill or meet. This kind of dependency does not have to be direct, however.

Another aspect of such social property of the model is that conflicts are not easily resolvable between agents. Depending on the kind of the environment, agents can have more rigid or fluid requirements towards other agents. Such requirements can change over time or new ways to satisfy such requirements can be offered by other agents. Relationships between agents can dissolve and new ones can appear. Therefore it is important to maintain an explicit representation of the competing interests and their conflicts.

Since agents are autonomous, it is ultimately up to them to decide, whether they would engage in cooperation or not. Cooperation arrangements may not be stable. The potential for successful cooperation may be assessed through the analysis of agents' goals and beliefs. Techniques are needed to support the analysis of various aspects of cooperation, including synergy and conflict among goals, how to discover shared goals, and how goals may change.

Finally, agent relationships form an unbounded network. There are no inherent limits on how far the impact of dependencies may travel in a network of agents. In considering the impact of changes certain question can be addressed, such as: Who else would be affected? Who will benefit, who will be hurt? Who can help me improve my position? Those questions can lead to the discovery of new agents, that were not considered earlier.

This aspect of sociality is mainly captured when creating a Strategic Dependency Model, that would be described in details later.

3.2.1.4 Rational Self-interest

Rational Self-interest is manifested in an idea, that every actor strives to achieve it's goals, yet it does not mean that every actor would necessarily take a rational path to achieve those goals. Such irrational behavior might have it's origin in the incompleteness of the agent's information, flawed reasoning about the means of achieving certain goals and the expected payoff of such goals. At the same time, self-interest does not imply a totally opportunistic behavior, since an agent usually has social relations with other agents and it is in it's self interest to live up to it's commitments.

To reflect the rational self-interest of agents, a Strategic rationale model is created. Such model is based on the Strategic Dependency model and further developed by attributing goals, tasks, resources, and softgoals to each actor, this time as internal intentional elements that the actor wants to achieve. A means-ends link is used to connect a task to a goals, indication a specific way to achieve the goal. A task can be further specified through task decomposition links to indicate the subtasks, subgoals, resources, and softgoals that need to be performed or satisfied in order for the task to succeed.

Tasks have contribution links to softgoals indication how they contribute to achieving those qualities. High level softgoals are refined into more specific softgoals through AND, OR combinations as well as partial contributions. Softgoals help distinguish among alternate tasks that can achieve the same goal, but differ in how the affect desired quality attributes.

3.2.1.5 Identity and Boundary

The identity and the scope of an actor are determined by a modeler in i^* . It is ultimately the decision of the modeler, whether an actor would represent a physical person or a group of people. Those decisions would allow different opportunities for analysis as well as a scale at which the model is built, for example: a single person fulfilling a certain role, a team, an organization. Furthermore, the boundaries and the identity of an agent are contingent and changeable. By reallocating a task from one agent to another the boundary of responsibility changes for both agents, as well as their relations with other agents.

Lastly, in i^* , the term agent is used to refer to actors with physical embodiment. An agent may play multiple roles. A set of roles typically played

by one agent is called a position.

3.2.1.6 Strategic Reflectivity

Since intentionality is one of the focal points of i^* , it is possible to visualize trade-offs across multiple competing or synergistic goals. A modeler can take a position of an actor to lay out actor's considerations and trade-offs regarding achieving goals, having relations with other actors and making judgements about the merits of various configurations with respect to its own strategic interests. Typically, operational configurations are expressed through SD models. The alternatives considered in SR models refer to alternative SD configurations that have different consequences for the different implications for the various strategic interests held by each actor.

3.2.2 Creating Strategic Dependency and Strategic Rationale models

RE for large software projects is a massive undertaking that needs to take into account a lot of data and structure it in a way useful for various stakeholders to use it in the future. To bridge the gap between the real life agents and the software they need a goal-oriented approach in the form of i^* language is suggested [32, 17]. The idea behind this approach is to capture the goals of the real life agents, their relations, understand their motivations, intents, and rationales by asking "why, how, and how else" questions. This would allow to lay out a solid foundation for the future RE that would be more focused on the technical aspects of the software to be developed. By focusing on the goals of the agents and their relations through the dependencies it becomes clear, by whom and in what way the software would be used, as well as with what other potential software it can interact [16]. The functionality of the software can be derived in the future from the decomposed goals of each actor, reducing the risk of developing the wrong software due to the lack of meaningful context.

The following papers study the application of i^* to the early stages of RE [32, 17]. The first step is creating a Strategic Dependency (SD) model. The result of the first step are actors and their goals, that depend on the other actors. This model focuses mostly on the "Why?" questions when it comes to RE by focusing on the intentional relationships between the actors. This allows a better understanding of a situation as a whole.

The second step is creating a Strategic Rationale (SR) model. The result is a model that shows actors' interests and rationales by looking "inside" actors to model internal intentional relationships. Intentional elements (goals, tasks, resources, and softgoals) appear in the SR model not only as external dependencies, but also as internal elements linked by means-ends relationships and task-decompositions. "The SR model provides a way of modeling stakeholder interests, and how they might be met, and the stakeholders evaluation of various alternatives with respect to their interests. Task-decomposition links provide a hierarchical description of intentional elements that make up a routine. The means-ends links in the SR provides understanding about why an actor would engage in some tasks, pursue a goal, need a resource, or want a softgoal. From the softgoals, one can tell why one alternative may be chosen over others."

Furthermore, according to the study the primary goal of early stage RE is "helping stakeholders gain better understanding of the various possibilities for using information systems in their organizations, and of the implications of different alternatives". *i** offers a several levels of analysis in terms of ability, workability, viability and believability. Ability analysis shows what kinds of tasks an actor is capable to carry out. Workability provides knowledge which routines can be executed. It includes the dependencies of actors involved and shows if it is possible in principle to complete a routine. Viability shows what softgoals would be achieved given a routine. In some routines tasks to be completed to achieve a goal would have a negative relationship or no relationship at all with some soft goals, that can also be important to the organization. Finally, believability analysis can be performed to justify the goals and the routines of the actors. During this a justification for goals and softgoals of the actors is presented, one of the most common ones being an actor satisfying it's own interests.

Once SD and SR models are created, the next step is analyzing them. The following paper by J. Horkoff and E. Yu [19] studies the potential analysis methods regarding to how the analysis of the model is approached and what is the goal of the analytical process. The resulting framework was named GORE, Goal-Oriented Requirements Engineering. As per the first question, the following types of analysis are suggested: Satisfaction Analysis, Metrics, Planning, Simulation, Model Checking, and Survey Summary. Furthermore, the following goals of the analysis process were detected in the studies papers: Domain Understanding, Communication, Model Improvement, Scoping, Requirements Elicitation, Requirements Improvement, and Design The study

also provides a comprehensive table with a mapping of Objectives to Analysis Techniques.

3.3 Coopetition modeling

Coopetition theory was proposed as a mean to connect the competitive and cooperative economic perspective on the coordination problem between independent companies [33]. One of the first works in the field takes a look at this problem from the perspective of the game theory [34].

3.3.1 Tensions in Paradoxical Relationships

Competition and cooperation are completely opposite behaviors that occur because of the opposite logic and assumptions [35]. Such relations create tensions between the coopeting actors. Coexistence of various degrees of cooperation and competition as possible, both in vertical relationships (i.e., buyer-supplier) and horizontal relationships(i.e., firm to firm) [36, 35, 37] . Another dimension exists within coopetition: a dyad (i.e., between two actors) or in a network [38]. Dyadic type of coopetition can be analyzes from the perspective of procedural coopetition, where an activity is an appropriate unit of analysis while network coopetition can be regarded as contextual competition where actor is a suitable unit of analysis [39, 40] .

3.3.2 Key Features of Inter-organizational Coopetitive Relationships

Organizational theory researchers have identified a number of characteristics that define coopetitive relationships [11, 41]. Such include, but are not limited to, complementarity [42], interdependence [43], trustworthiness [44], and reciprocity [45].

3.3.2.1 Complementarity

Using a definition of Tee and Gawer [42], "complementarity refers to the combined returns from the combination of two or more assets, with some combinations resulting higher value creation than other combination". Synergy is often used as a synonym of a complementarity, meaning "the whole

is greater than the sum of its parts”. A number of synergistic relations is described in the study, such as: overlap avoidance, knowledge protection, and development of common objectives.

3.3.2.2 Interdependence

Luo [43] describes interdependence as being ”concerned with the extent to which work processes that have strategic implications are interrelated. The study states that the companies become more prone to becoming interdependent when they have ”partially congruent interest structure”. Because of that, interdependent companies oftentimes have cooperative relations, since ”each competitor will have a specific individual interest in carrying out an agreement”. A number of ways in which companies can be interdependent is described in the study: relationship-specific assets, interconnecting resources, and knowledge sharing.

3.3.2.3 Trustworthiness

According to Singh et al.[46], ”trust refers to the expectation that another business can be relied on to fulfill its obligations. The construct of trust according to [44] consists of ”(a) impartiality in negotiations, (b) trustworthiness, and (c) keeping of promises”. An important distinction between trust and trustworthiness is that trust is an attribute of a relationship and trustworthiness is an attribute of individual exchange partners. Trustworthiness is an important measure for companies, since trust and contracts serve as governance mechanisms in cooperative relationships. Trust can be grown in a number of ways, such as: increasing communication, avoiding coercion, and increasing linkages.

3.3.2.4 Reciprocity

Ashraf et al. [47] define reciprocity as :rewarding kindness with kindness and punishing unkindness with unkindness”. Fehr and Gächter [48] note that ”reciprocity is a rather stable behavioral response by a non negligible fraction of the people. Reciprocity is also often referred to as a mean to enforce cooperative behavior and is commonly used in game theory to explain social behavior in sequential move games such as ultimatum game and gift-exchange game [49, 50].

3.3.3 Modeling support

One of the most important results of Pant's paper [21] is a List of requirements for modeling enterprise cooperation and an Assessment of modeling support for requirements. A List of requirements for modeling enterprise cooperation presents a list of properties that can be represented in the modeling notation. The study also provides a mapping between the two tables. This allows to make an assessment of the existing modeling languages from the perspective of cooperation. As visible from the table, *i** has the capacity to visualize more cooperation characteristics, compared to other modeling languages presented in the research.

3.3.4 e³value models

According to J. Gordijn and J.M. Akkermans [9] "a value model shows actors who are exchanging things of economic value with each other". For the purpose of modeling, a number of generic concepts, relationships, and rules are defined. The authors emphasize that the purpose of the model is to show *what* is being exchanged and does not concern itself with *how* this exchange is performed.

3.3.4.1 The e³value ontology

An **actor** is an independent economic agents that participates in the exchange and is striving to increase its utility. In a sound, viable, value model each actor should be capable of making a profit or to do utility increase.

A **value object** is an object that is being exchanged by actors. Those object may be of different nature, such as services, goods, money or even customer experiences. The important point is that each object is of value to at least one of the actors.

A **value port** is a way of showing by an agent to the environment that the agent wants to perform a transaction, either receiving or offering an object.

A **value offering** is what is being exchanged from one value port to another.

A **value interface** construct consists out of a number of value ports and value objects connected to them. In its simplest form, a value interface consists out of one value port. Within the e³value model, a value interface is an atomic unit of object exchange, meaning that for the exchange to occur,

all incoming and outgoing ports need to be satisfied. This ensures that actors only participate in desired exchanges.

A **value exchange** connects two value ports and represents that two actors, owning the value ports, are willing to participate in the exchange.

A **market segment** represents a group of actors with similar common properties. Such construct is used to reduce the complexity of the model.

3.3.4.2 Application of value models to i^*

i^* value models can be applied to i^* to depict the added value through the synergy [22]. Such value model can be built on top of SR model. The paper proposes a following mapping:

- Actor in SR maps to an actor in value model
- Depender task, Dependence resource, Dependee task map to value port, value offering and a value exchange

Furthermore, each actor has a perceived *willingness to pay (WP)* and *opportunity cost(OC)* constructs regarding to each value exchange. Willingness to pay refers to the maximum resources that an actor will voluntarily relinquish in exchange for another resource. Opportunity cost refers to the minimum resources that an actor will voluntarily accept to relinquish another resource. The logic behind WP and OC holds because actors will only willingly participate in transactions where they would give up the less valuable object for the more valuable one.

Those constructs are used in the paper to indicate that in a Multi-party economic relationship, if two agents can offer complimentary goods to the third actor, such complimentary goods together can be of higher value to the third actor compared to the other substitute goods it might acquire.

3.3.5 Using game trees to understand strategic moves and reciprocity

i^* modeling language is good for giving an overview of the interdependencies of the actors, their wishes and incentives, however lacks the capacity to sufficiently show the order of strategic moves and reciprocity in the strategic relations. To extend the capacity of i^* , it is possible to use SR diagrams to create game trees on top of them [23]. Game trees offer the ability of analysis

where actions of one actor impact the actions of another actors. Game trees are a variation of decision trees, as in decision trees depict the decisions of once actor, whereas game trees show the actions of multiple actors. Furthermore, they allow to create a graphical representation of the players' possible choices, the sequence of such choice at every point of time and payoffs from their choices [51]. Next, game trees can be used for a player to find an optimal strategy in a form of a sequential moves while taking into account the moves of other players [52] .

The rationale behind using the game trees is to find a positive sum game outcome, where each player would have more value compared to when they started the game. Such outcome is more likely to be accepted by all players, even though the players are expected to maximize their own value outcome. Purely opportunistic behavior oftentimes yields less value than a cooperative one, since trying a zero-sum strategy by one player is balanced out by the decisions of the other player, that also tries to maximize it's value outcome.

3.3.5.1 Co-developing a complementary i^* SR diagram and Game Tree

Here a co-developing process of SR and game trees is explained based on the work by V. Pant [23].

The process starts with the creation of SR diagram and identifying the stakeholders, which would be represented as actors in i^* . After that, those actors are represented as players in the game tree diagram and a focal player is selected. A focal actor is an actor that makes the first move, i^* and game tree diagrams are developed from his perspective.

Next, in i^* model, goals of stakeholders are defined and then decomposed to tasks. In game tree, those tasks are moves that can be undertaken by both actors.

Further step in i^* diagram creation is defining the quality criteria of each stakeholder, softgoals in i^* notation. Those softgoals are give priorities to, as in satisfying which ones would yield more value to the actor. Next, the impact of alternatives on those softgoals needs to be evaluated. This is done by evaluating each task that does not have a contribution link with a softgoal and assigning a contribution link between those two elements if necessary. Analyzing dependency links between actors is the next step. Once again, by going thought all tasks of an actor and evaluating if it has a dependency on another actor. Finally, label propagation is performed, where each involved

element receives a label and an evaluation of it, whether it is being satisfied or not. Such label propagation allows to show what tasks, softgoals would be satisfied, depending on what choice of actions is chosen by a specific actor.

After that, approximate relative payoffs for decision trees can be calculated by using the game trees. The approximate relative payoffs are based upon what softgoals and to what extent are being satisfied for each actor. The analysis of the game tree can be performed by looking forward and seeing what choices and in which order are made by actors, as well as by reasoning backwards, starting from the expected outcomes for each actor and looking into the potential path to such outcome.

Finally, i^* SR diagram can be analyzed by looking at satisfaction or denial of goals. For the game trees, the main criteria is searching for a win-win strategy, that is more likely to be accepted by both actors.

In case no win-win strategy is found, a number of questions to find one is proposed in the study to further develop the i^* diagram:

- Do existing alternatives contribute to a win-win strategy?
- Do existing objectives contribute to a win-win strategy?
- Do existing relationships between stakeholders contribute to a win-win strategy?
- Do existing quality criteria contribute to a win-win strategy?
- Do existing stakeholders contribute to a win-win strategy?

3.3.6 Generating win-win strategies for software business under coopetition

A way to generate win-win strategies for software business under coopetition was further studied in the following paper [24]. It expands the method discussed in the Section 3.3.5. After both i^* and game tree diagram are completed in case no win-win strategies are found, the exploration phase commences.

The exploration phase is aimed to find a win-win strategy through the following activities:

- Generate a change in relationships among two actors

- Generate a change in softgoals of some actor
- Generate additional alternatives for achieving goals of some actor
- Generate a change in some actor's goal
- Add/Remove some actor

The study suggests execution of such steps in no particular order, however the activities are listed from the ones what would cause the least re-evaluation needed for the i^* model to the ones that would require more re-evaluation activities to be done.

3.3.7 Getting to win-win in industrial collaboration under coopetition

Getting to win-win strategies can be achieved through taking a closer look at softgoals and the way they are satisfied, as indicated in the study [7].

The aforementioned example studies the softgoals of the pharmaceutical companies and defines two main ones: "no leakage of the knowledge assets" and "no blocking of knowledge transfers". The main idea behind a suggested approach is decompositions of the main softgoals into more comprehensible, concise ones. After the softgoals are decomposed, the ones from the lowest level are assigned operational tasks. It is worth noting, that the tasks and softgoals are decomposed under the premise that both actors have a vision on how to satisfy the main softgoals, in this concrete case they manifest into grouping tasks into Strict Knowledge Sharing (S) and Permissive Knowledge Sharing (P) policy type. This means that at any given time only one task group would be used. Check marks and "x" marks represent the satisfaction of a softgoal under an enforced policy: left ones for the "S" policy, right ones for the "P" policy.

After the decomposition phase is complete, the suggested course of action is further studying the context of the field of study to find alternative softgoals and tasks that can be added to the model. Such added tasks and softgoals need to contribute to the softgoals, that block the satisfaction of the main softgoals under either policies.

Chapter 4

Modeling

This chapter describes the modeling procedure of the Amazon RDS and Microsoft case. The procedure is described using a Process Delivery Diagram (PDD) shown in Figure 4.1. The technique for the creation of PDD is described in [53]. The modeling procedure is based on the works of Vik Pant [20, 22, 23, 24, 7].

First, the case description is given Section 4.3 . Next, a strategic dependency diagram (**SD**) is created following the procedure described in the [20, 22, 23, 24, 7]. After, the strategic rationale (**SR**) model is created. The next step is creating a game trees model. Finally, e3value model is created.

4.1 Model creation guidelines

For this research, a number of guidelines were compiled for the creation of each model. Those guidelines and the related papers are used to create each type of the model. However, those guidelines are not final and while still used to create each model, are a subject to change. After the modeling process is over each guideline is evaluated whether is was helpful for the modeling process. New guidelines, derived from the problems during the modeling process, can also be added to the guidelines list.

4.1.1 Metamodel

Figure 4.2 shows the metamodel of relations between i* model, game trees model and e3value model. i* part of the model is adopted from the descrip-

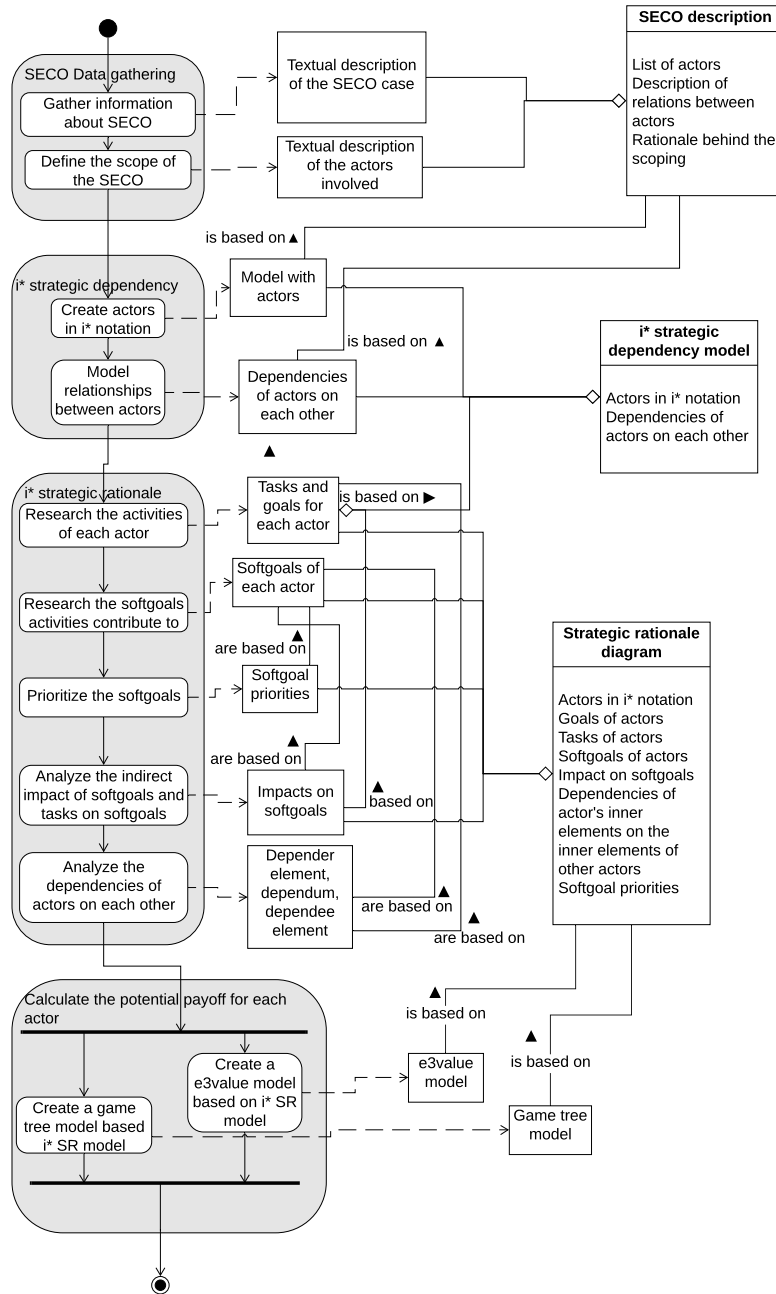


Figure 4.1: PDD for the modeling process

tion of i^* modeling language in [6]. Game trees part of the metamodel is derived from [24]. e3value metamodel part is derived from [9].

4.1.2 Model creation process

The modeling process for i^* , game trees and e3value models is shown in figs. 4.3 to 4.5. Modeling process follows three main phases: modeling, evaluation and exploration. The guidelines for the creation of each model, as well as the sources for those guidelines, are listed in tables 11 to 13.

Modeling phase consists of activities that convert real life knowledge of the situation into the elements of the model, e.g. actors, goals, tasks for i^* . For game trees, additional steps in the modeling phase are: "Represent Focal Player as First Mover" and "Represent Sequence of Moves as Decisions". Those steps occur after the corresponding elements in i^* (Actors, Agents, Roles and Tasks) are modeled. For e3value models the additional steps in the modeling phase are "Develop e3value actor model" and "Develop e3value activity model". Those steps are taken after all i^* modeling is complete.

Evaluation phase consists of activities that assign values to elements. In case with i^* , labels are propagated to softgoals. For game trees, those labels are used to compute the payoffs for Decision Paths. For e3value models, added value for each activity and actor is evaluated.

The final phase, Exploration Phase, consists of activities that improve the model. Those activities propose changes within the model with the goal to improve it. Those activities are ordered, however this order is more of an indication what steps should be attempted firsts and which activities should be considered later. The rationale behind this order is that small changes requiring less modeling resources (namely time and mode data gathering) should be attempted first, then more costly alternatives should be considered.

4.2 Modeling process

4.2.1 SD and SR modeling process

Strategic Dependency (SD) model includes actors and dependencies between them. This model is created first and serves as a foundation for the SR model. As the SR model becomes enriched, those changes need to be reflected in the SD model as well.

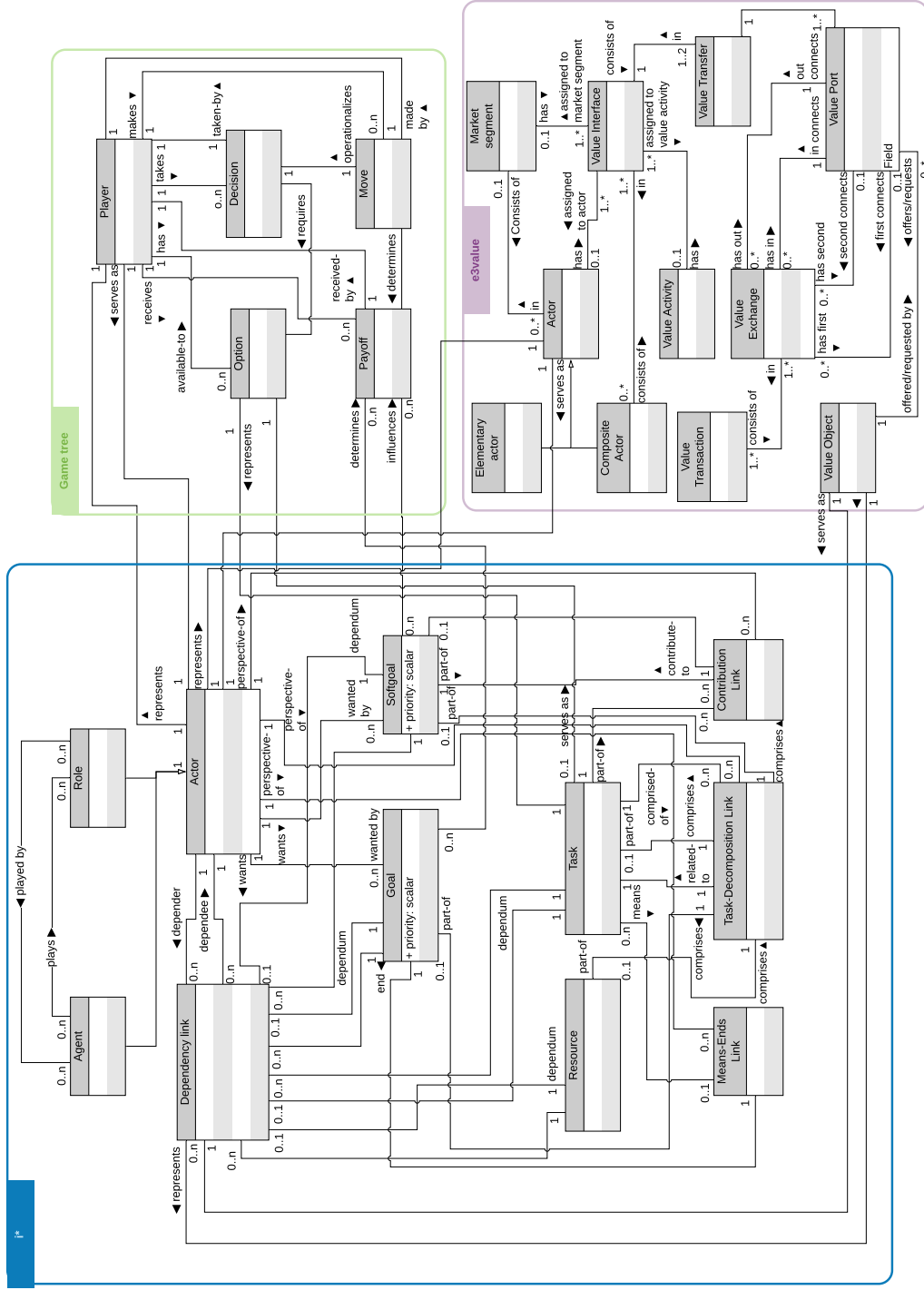


Figure 4.2: i*, game trees and e3value metamodel. The model shows relationships between the elements within each model, as well as the relations between the elements of different models.

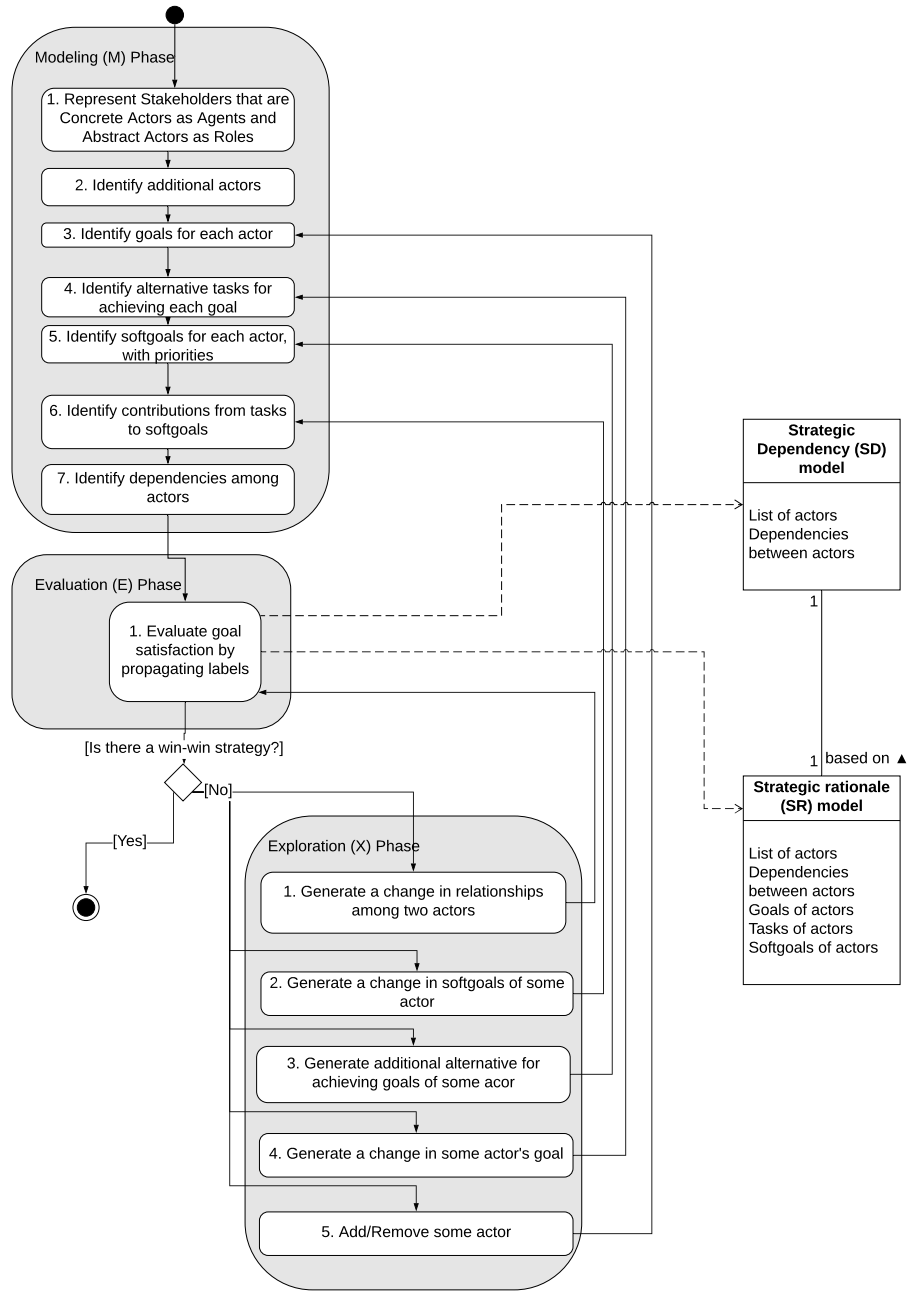


Figure 4.3: i* model creation process. Adopted from [24].

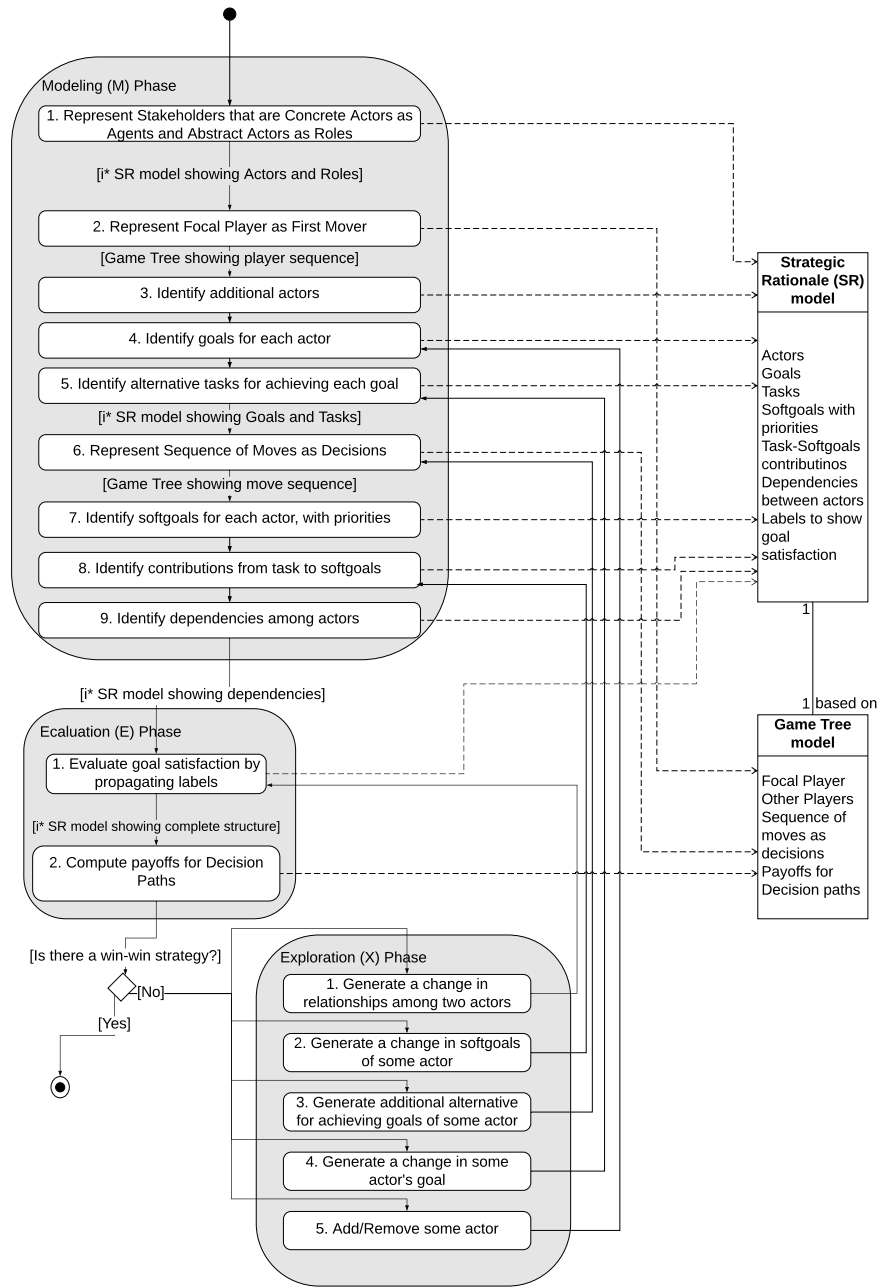


Figure 4.4: The process for creating game trees based on an i* model. Adopted from [24].

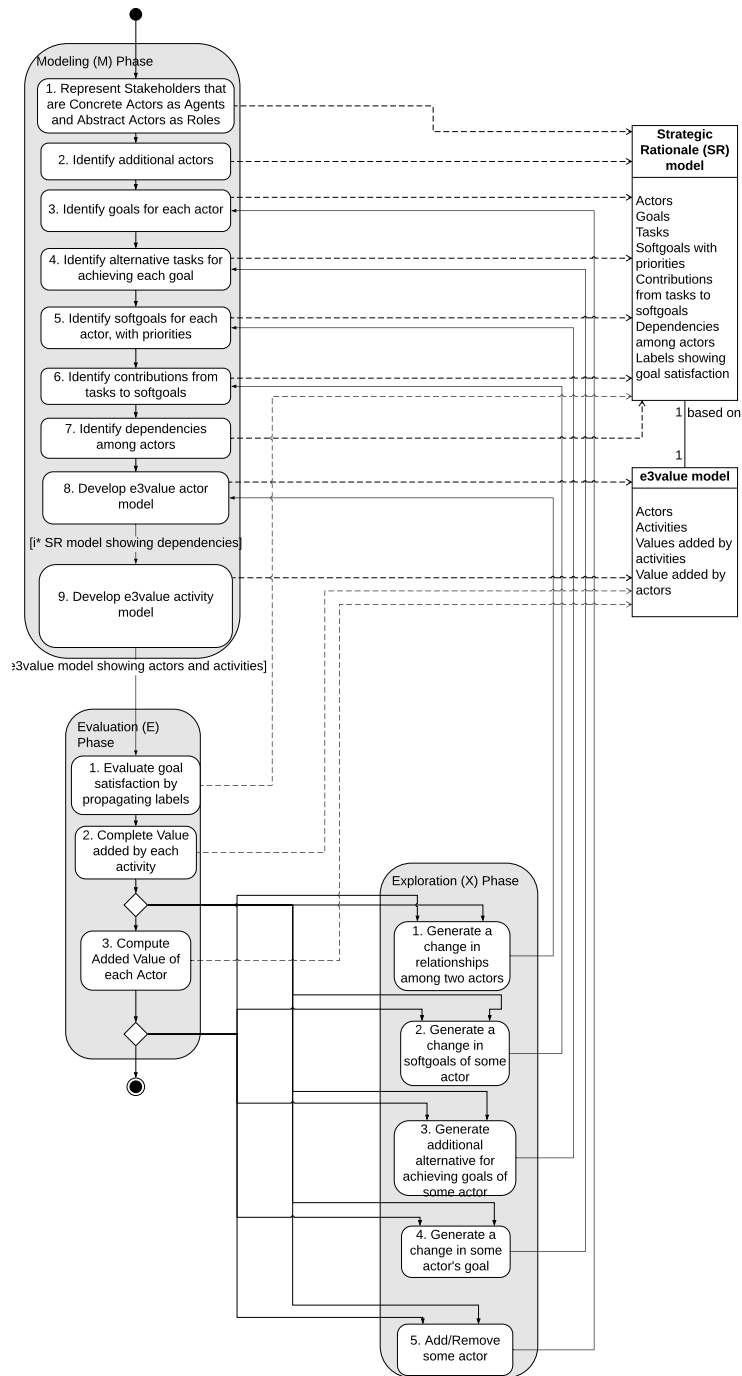


Figure 4.5: The process for creation of e3value models. Based on [22].

According to [6] "The Strategic Rationale (SR) view shows all of the detail captured in the model, including actors, dependencies, actor association links, and the internal details of each actor."

An altered version of i* is used for the modeling. Contribution links are presented as green and red lines, instead of having labels on top of them. This change is intended to increase the readability of the model.

Furthermore, "Make" and "Help" contribution links are aggregated into green lines, "Hurt" and "Break" contribution lines are aggregated into red contribution lines. This aggregation takes place because during the creation of the model academic literature and documentation offered by the companies was used. From this documentation, it is difficult to reason about the degree of contribution.

The model was initially created with only incidental contribution links. Incidental contribution links in the context of this work are the links that connect tasks to softgoals and the links occurring during the element decomposition (softgoal, task, goal decomposition). Coincidental links are connections between elements that occur neither during element decomposition nor during the initial connection of a task to a softgoal. The process of identifying coincidental contribution links is iterative and consists of going through all elements in the actor for each actor in the model. For each element, a question is asked "Does this activity or softgoal have any influences on other activities or softgoals?" and an appropriate connection is created. The process ends when no new connections are found.

4.2.2 Priorities of softgoals

The notation of priorities is described in [23]. In the SR model three levels of the priority were used explained in Table 4.1.

Table 4.1: Priorities of the softgoals in the SR explained

Priority	SR notation	Game trees conversion
Low priority	No exclamation points	1 point
Medium priority	One exclamation point (!)	2 points
High priority	Two exclamation points (!!)	3 points

Due to the resource limitation of the research and the limited access to the knowledge about the preferences and the intentions of the actors, the

priorities of the softgoals were assigned by interpolating and extrapolating the informations sources used to create a SR model. Furthermore, some experts from the software development field were consulted regarding their vision of the plausible priorities of the softgoals of the Amazon, Amazon RDS, Microsoft, Microsoft SQL Server and Microsoft Azure.

4.2.3 Game trees creation process

The process of creating a game tree model follows the guidelines laid out by Vik Pant [24, 7] . For each game tree, a certain scenario is chosen. For each scenario, a softgoal of the highest priority is chosen as well as a set of softgoals that are critical to the satisfaction of the scenario.

Next, a part of the SR model is chosen to make game tree creation process more comprehensive. The part chosen includes all elements related to the softgoals chosen for the scenario. Afterwards, the decomposition of those elements is possible to make the model ready to be translated into game trees. This step has the following rationale behind it: the SR model with all elements can be of a large size. In most cases, dependencies between two tasks placed in two different actors can have two scenarios: the dependee element can either share the result of the task with the depender element or not. As a consequence, the amount of elements (namely tasks) that have a dependency on them can effectively double, making the SR model even less usable. Since readability of the model, especially a large one, is a serious issue, "squashing" the tasks is practiced. This is true for the elements created within the actor that satisfy the actor's needs, not for the elements created to satisfy other actor's needs. Next, for the scenario model, the elements are "unsquashed" in order to make the model ready for the translation into the game trees model. The unsquashed elements are portrayed in the light blue color.

Next, labels are propagated on the SR model according to the scenario. After that, a game tree is created. The outcomes of the game tree are calculated according to the amount of softgoals satisfied and non satisfied. Each softgoal has a score assigned depending on it's importance for each actor.

4.2.3.1 Calculating outcomes for game trees

Function $f(x)$ is defined as a function that determines the degree of completeness of a task, where x is a task within the SR model. For each task within the model $0 \leq f(x) \leq 1$, where 0 denotes that the task was not completed at all and 1 that the task is completed fully.

Given there is a task $T1$ that has a positive contribution link to the softgoal $S1$ the following logic is applied. If $T1$ has a dependency on a task $TD1$ and a task $TD2$, the contribution of the task to the softgoals should be calculated based on the satisfaction of the $T1$. If no other information is provided, $TD1$ and $TD2$ contribute to the $T1$ equally. So, for example, if only $TD1$ is satisfied, then $T1$ contributes to $S1$ with an efficiency of 0.5 and the contribution of $S1$ within the given situation will become $S1 * 0.5$. Furthermore, for each scenario only the relevant softgoals contribute to utility.

Variables:

- $s_{i...n}$ – set of weights of given softgoals based on the priority of the item in the SR model
- $x_{k...m}$ – set of tasks related to the softgoal

Generalized, the formula for utility can be written as following:

$$Utility = \sum_{i=1}^n \left(s_i \frac{1}{m} \sum_{k=1}^m f(x_k) \right)$$

4.2.4 e3value model creation process

For the creation of e3value models, guidelines laid out in [22] were used.

4.3 Case description

4.3.1 Case overview

Both companies (Amazon and Microsoft) are in the state of coepetition since they have overlapping services that they provide: Database as a Service (DBaaS).

For Amazon, Amazon RDS serves as a DBaaS. Amazon RDS offers several database engines, including the one developed by Amazon and the one based on Microsoft SQL. For Microsoft, Microsoft Azure serves as a DBaaS. DBaaS offers a number of database engines, similar to Amazon RDS. One of those database engines is also Microsoft SQL.

Amazon and Microsoft exist in the market where they sell their services to the businesses. Within this research, the businesses are split into Large enterprise (**LE**) and Small medium enterprise (**SME**) categories. Amazon and Microsoft provide their service directly to SME. For LE, the service is provided to LE IT Department, since for large enterprises IT Departments are fairly large and complex entities.

As per aforementioned definition, co-competition occurs in the relations between companies that have competitive and cooperative relations at the same time. Within this case, competition between Amazon and Microsoft occurs when they both need to sell their DBaaS service – Amazon RDS and Microsoft Azure – to the business. At the same time, Amazon and Microsoft rely on each other: e.g. Microsoft includes Microsoft SQL into its DBaaS and then sells DBaaS to the business. In this example both companies benefit: Amazon by selling its product to the business, Microsoft by selling a Microsoft SQL license to Amazon.

4.3.2 Amazon RDS

Amazon RDS (ARDS) is a cloud-based relational DB (DB) service by Amazon Web Services. The primary function of this product is providing a managed relational DB service.[54] A managed relational DB service manages DB instances: an isolated DB environment in the cloud. Each DB instance runs a DB engine. At the time of writing ARDS supports: MySQL, MariaDB, PostgreSQL, Oracle and Microsoft SQL Server DB. ARDS does not provide shell access to DB instances, instead AWS Command Line interface, the Amazon RDS API or the AWS Management console are used to manage databases.

4.3.3 Microsoft SQL server

Microsoft SQL server (MSQL) is a relational database management system developed by Microsoft [55]. The primary function of the product is storing and retrieving data as required by other software applications. Microsoft

offers several editions of SQL server with varying functionalities and qualities. For this paper local edition (e.g. Enterprise, Express) and cloud-based (e.g. Azure) editions are of the biggest interest.

4.4 Strategic Dependency and Strategic Rationale models

4.4.1 Strategic dependency model

Strategic dependency model shows dependencies between Amazon, Microsoft, Amazon RDS, Microsoft Azure, Microsoft SQL, Large Enterprise, Large Enterprise IT department and Small & Medium Enterprises. The model is shown in Figure 4.6, the description and sources for the actors, dependencies can be found in Table 10.

4.4.2 Strategic rationale model

During the modeling process, in addition to the SR model a number of tables with sources and explanations of elements were created Table 4.2. The strategic rationale model is shown in Figure 4.7, tables with sources and descriptions of the elements, as well as the dependencies, are in the Section A:tables 1 to 8.

4.4.2.1 Company: Amazon and Microsoft

Revenue generation and market dominance are considered to be the top priorities for Amazon and Microsoft. This conclusion is made due to the fact that as long as the company generates revenue, it continues to exist. Hence, "profitable" softgoal is of the biggest importance. Without the revenue, the company is on it's way to bankruptcy. The biggest factor that contributes to the company's revenue is market dominance. Market dominance is reflected by "up to date market strategy" softgoal.

Next on the priority list is having knowledge about market and a well developed product. Knowledge about market would allow to understand what steps can be taken to achieve the strategic goals of the company. Softgoals reflecting the current knowledge about the market of the company are: "up

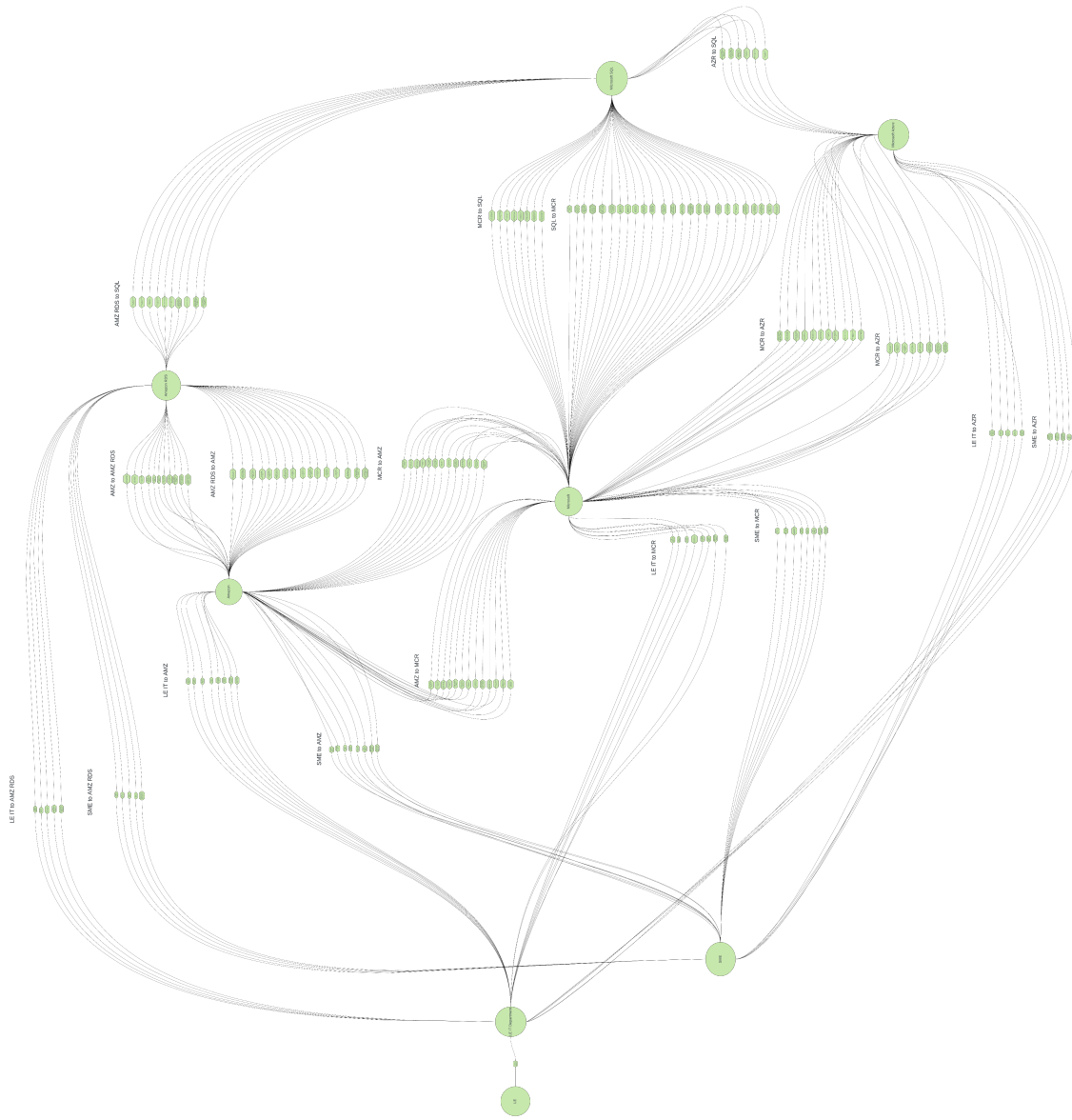


Figure 4.6: Amazon RDS and Microsoft SQL Strategic Dependency model

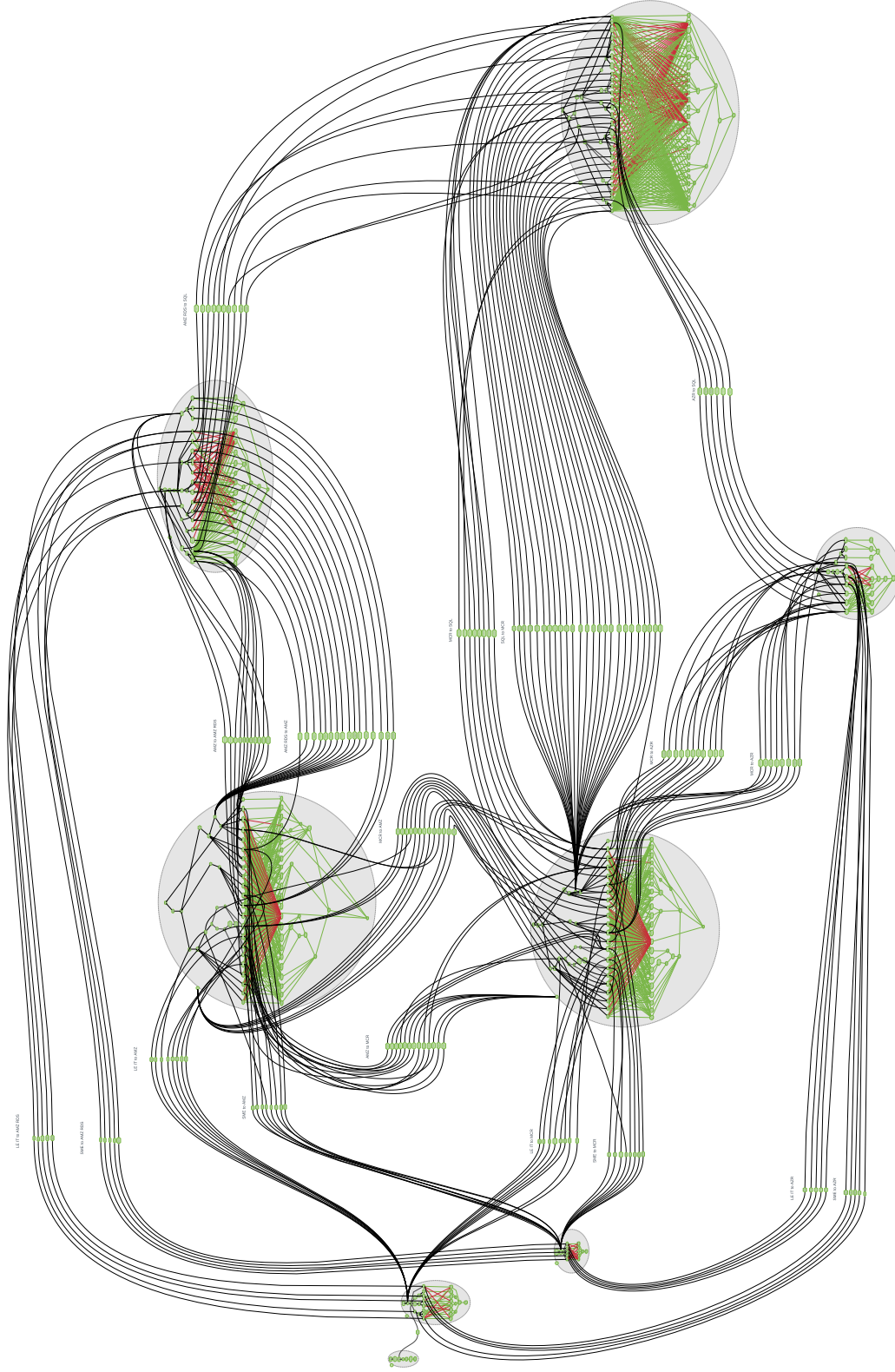


Figure 4.7: Amazon RDS and Microsoft SQL Strategic Rationale model. The model shows dependencies between actors (Amazon and Microsoft), their products (Amazon RDS, Microsoft Azure, Microsoft SQL) and the customers (Large Enterprise with it's IT department and Small-Medium Enterprise). Internal structure of each actor can also be seen, with goals decomposed to tasks, those tasks giving positive or negative contribution to softgoals.

Table 4.2: i* meta model and corresponding elements in the sources and explanation tables

i* Meta model element	Corresponding table	Element type in table	Explanation
Goal, softgoal, resource, task	Section A, Table 1 to Table 8	Element	Name of the element within an actor, role or agent
Goal, softgoal, resource, task	Section A, Table 1 to Table 8	Type	Type of the element within the actor, role or agent: goal, task, resource, softgoal.
Goal, softgoal, resource, task	Section A, Table 1 to Table 8	Description	Description of the nature of the element as well as the context of the element and how it fits in the context of the SR model.
Goal, softgoal, resource, task	Section A, Table 1 to Table 8	Source	Source of the element.
Contribution link	Section B, Table 9	Actor	Actor where the contribution link is placed.
Contribution link	Section B, Table 9	Contributor	The contributor element of the contribution link, where the contribute link points from.
Contribution link	Section B, Table 9	Recipient	Recipient of the contribution link, where the contribution link points to.
Contribution link	Section B, Table 9	Type	Type of the contribution link: hurt or help.
Contribution link	Section B, Table 9	Explanation	The reasoning behind the creation of the contribution link, as well as the context of the contribution link and the contributor and recipient elements, if necessary.
Dependency link	Section C, Table 10	Depender	Actor to which the depender element belongs to.
Dependency link	Section C, Table 10	Depender element	The depender element, the dependency link points from it.
Dependency link	Section C, Table 10	Dependee	The actor to which the dependee element belongs to.
Dependency link	Section C, Table 10	Dependee element	The dependee element.
Dependency link	Section C, Table 10	Dependum	The dependum element. Depicts the nature of the dependency between the depender, depender element, dependee and dependee element.
Dependency link	Section C, Table 10	Dependum type	Type of the dependum element: task, goal, resource, quality.
Dependency link	Section C, Table 10	Explanation	Further explanation of the nature of the relationship and the necessary context.

to date market trends”, ”analysis of customer win/loss”, ”analysis of competitors”. Next, a well developed product is important for the company since it is the main mean of generating the revenue. How well the product is being developed is reflected by ”product life cycle”, ”portfolio innovations decision”, ”business case analysis”, ”own product be well developed”, ”shared R&D assets”, ”acquired R&D assets”.

The rest of the softgoals are considered to be of low priority. Intellec-

tual property management can help to manage the assets of the company and act as a support for other, more important processes, such as product development, however are not the cornerstone for the company success. Sale processes of the partner's product, complimentary and competitive products are also of the low priority, since those processes can help generating more revenue, however without a solid product those activities would not compensate for a poor product.

4.4.2.2 Amazon RDS

An assumption is made that for the DBaaS the softgoals related to the resilience are of the most importance, since a service with a weak resilience can experience problems such as a corruption of a complete loss of the data, which are considered to be of catastrophic magnitude for both the service provider and the client.

Next in the priority list are the softgoals related to the security of the database. If those softgoals are weak, the breach of the security followed by the exposure of the company data can happen. Those are very high magnitude problems.

Performance of the service is the next on the priority list. If this softgoal is weak, this can lead to the loss of the potential clients, since clients can decide to switch to a service with more computational power.

4.4.2.3 Microsoft Azure

For Microsoft Azure, an assumption is made that the security is the most important softgoal of the actor, followed by the performance of the database.

4.4.2.4 Local database: Microsoft SQL

Microsoft SQL is a database that a user runs on the user's own hardware. In the context of this work, the biggest distinction between the local database and the DBaaS is that in case of a local database user has to be proactive regarding the resilience of the database, e.g. set up a system for backups. In case of DBaaS, a certain amount of automated systems, such as a system for snapshots, backups, failover databases, comes as a part of the service and does not require any additional labor costly set up.

Following this line of reasoning, an assumption can be made that a database should focus on being high performance, since the resilience and

the security softgoals can be compensated by the service the database runs on. This leads to the conclusion that "persistent memory devices are supported", "high performance of columnstore indexes" and "competitive other performance aspects" should be assigned the highest priority.

Interoperability is the second most important quality of the database, so "compatible with Linux", "A lot of container options", a lot of language options" and "a lot of platform options" receive the medium priority.

4.4.2.5 Customers

Customers in the model are split into small and medium-sized enterprises (SME) and large enterprises (LE). This split is based on works of B.P. Rimal et al. [56] and P. Gupta et al. [57].

LE IT Department For the LE IT department it is considered that the "improved security", "improved data governance" and "improved data mitigation" are of the highest importance. Achieving those softgoals is very important to the LE IT department because failure to achieve those can lead to drastic consequences, such as data loss or data leak. Those consequences are highly undesirable for the LE, since having problems related to data would lead to losses magnified by the client base, since LE is likely to have at least some personal and business data related to each client. This can lead to reputation damages, as well as lawsuits from clients based on the personal data leak. Those lawsuits can create significant financial losses.

"Improved scalability" is the second most important softgoal for the LE IT department. This conclusion can be supported by the claim that LE usually have a vast amount of IT infrastructure. As a consequence, having a scalable system is very important for the organization. "Improved interoperability" has the same priority, following the same line of reasoning.

SME It is assumed that the priority of SME is to have a database that is reliable and secure, then the database should be easy to use and improve sharing and collaboration. Finally, the database should also save money to the company.

4.5 Game trees models

4.5.1 Competition

Competition scenario, where both companies try to maximize the utility yielded from the competition with each other. Utility of each company is measured by the amount of softgoals each company can achieve as a result, the more softgoals the better. A SR model with competition scenario propagated labels Figure 4.8, a smaller model with only relevant actors and elements Figure 4.9, a game tree model Figure 4.11.

The "unsquashed" model in Figure 4.10 has a number of new elements. Microsoft has a **No collaboration** task and a **Collaboration with Amazon** softgoal. Microsoft SQL actor has a **Don't share roadmap** and a **Share roadmap** tasks. **Product roadmap** resource is the result of the **Improve product roadmapping** task from the original SR model. **Collaborate with Amazon** softgoal is also introduced in this actor.

Collaboration with Amazon in Microsoft and Microsoft SQL do not count towards the resulting utility since those softgoals do not contribute to the **Competitive** softgoal in Microsoft.

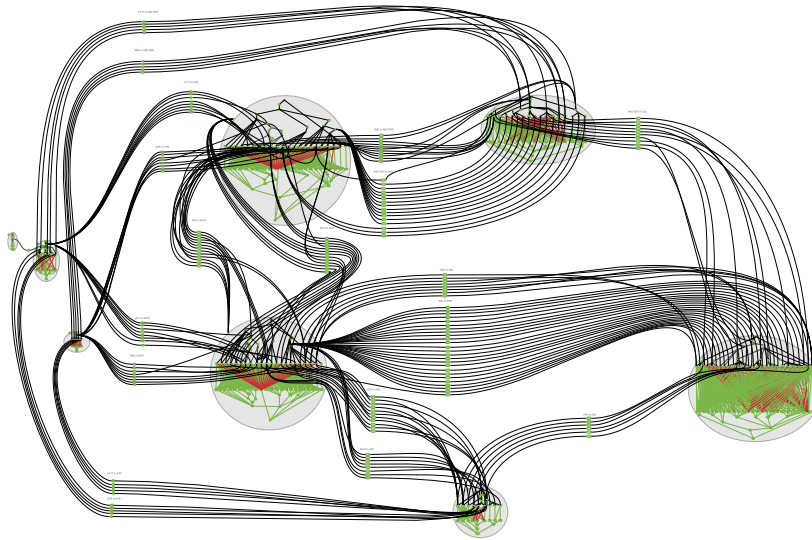


Figure 4.8: Strategic Relationship competition model. The labels in the Amazon and Microsoft actors show the goals to be satisfied.

For this scenario, Amazon is chosen as a focal actor. Satisfaction of the **competitive** softgoal is of the highest importance for Amazon and Microsoft. Furthermore, **one sided short term collaboration** is critical to the overall strategy of Amazon.

4.5.1.1 Amazon

Within the scope of the actor **One sided short term collaboration** is to be satisfied. This task helps the **shared R&D assets** softgoal and hurts **trustworthy** softgoal. This is based on the rationale that one sided short termed collaboration can be exercised by the actor, yet there is no guarantee that this task would always succeed, so in some cases the actor would be caught exercising such behavior without being able to yield the benefits from this behavior, yet still hurting it's trustworthiness.

The **one sided short term collaboration** task depends on two different tasks: **collect knowledge for short term collaboration areas** and **make collaboration agreement that meets short term goals**. **Collect knowledge for short term collaboration areas** has Amazon RDS for dependee, the dependee element is **improve core asset roadmapping**. **Make collaboration agreement that meets short term goals** has Microsoft for a dependee with a dependee element **Long term collaboration**.

4.5.1.2 Collect knowledge for short term collaboration areas

This dependee depends on an **improve core asset roadmapping** dependee element in the amazon RDS actor. **Improve core asset roadmapping** has a dependency on **Share roadmap** dependee element in Microsoft SQL actor via **gather knowledge for DBaaS core asset roadmapping from the database roadmapping** dependee.

Since the dependee element is not controlled by Amazon, but Microsoft instead, it is the decision of Microsoft whether to complete **Share roadmap** or **Don't share roadmap** task.

4.5.1.3 Make collaboration agreement that meets short term goals

Make collaboration agreement that meets short term goals has a dependee element **Long term collaboration** within the Microsoft actor. If Microsoft agrees to the agreement, the dependency for **make collaboration**

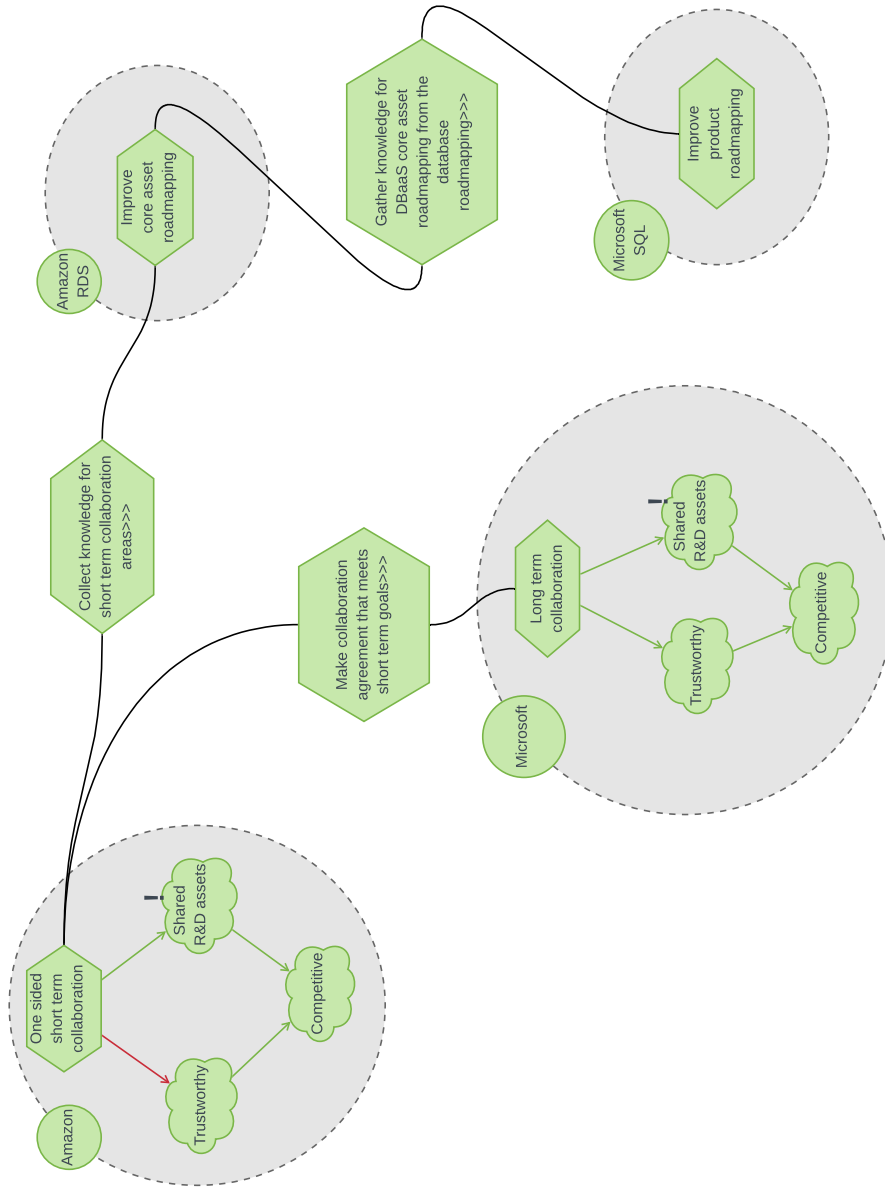


Figure 4.9: SR competition model with only relevant elements.

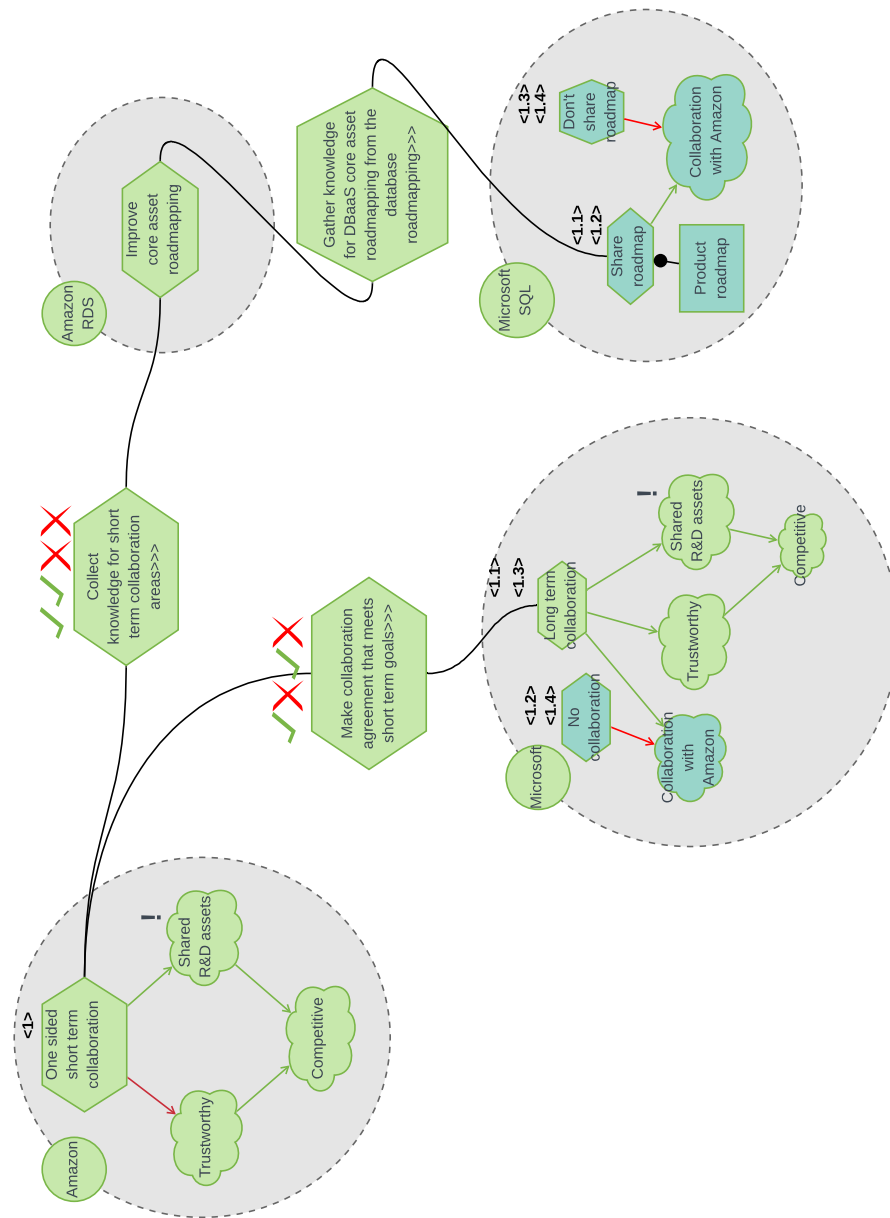


Figure 4.10: SR model for competition. Expanded with elements that allow better game tree modeling.

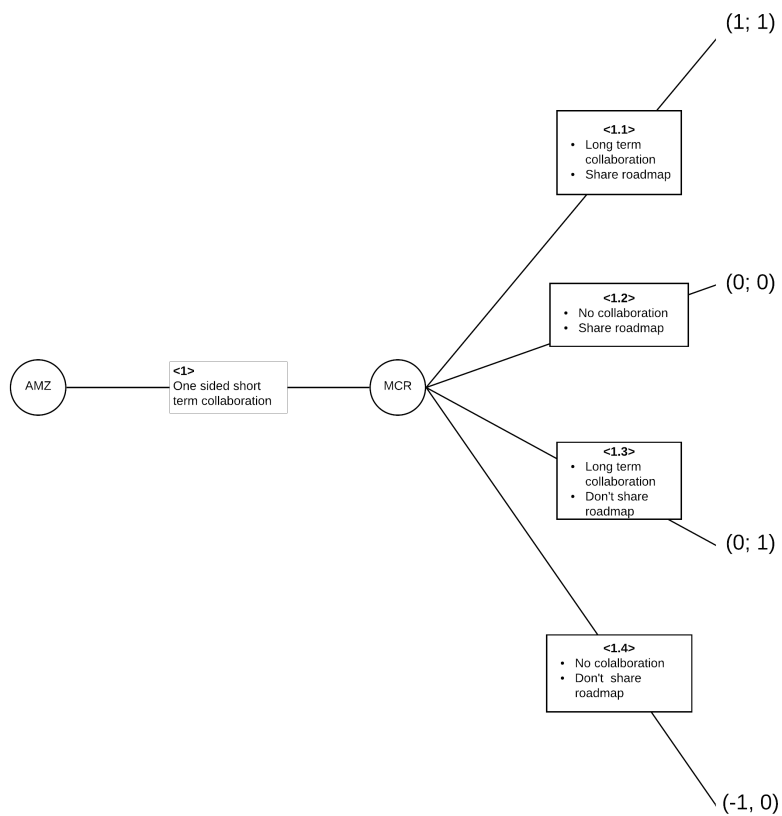


Figure 4.11: Game tree for competition scenario.

agreement that meets short term goals will be satisfied. Alternatively, Microsoft can decide to complete the **No collaboration** task.

4.5.1.4 Yes-Yes scenario

In this scenario Amazon manages to meet both dependencies for **one sided short term collaboration**:

- **Collect knowledge for short term collaboration** via **improve core asset roadmapping** in Amazon RDS via **gather knowledge for DBaaS core asset roadmapping from the database roadmapping** via **Share roadmap** in Microsoft SQL.
- **Make collaboration agreement that meets short term goals** task via **Long term collaboration** task in Microsoft actor.

This means that **one sided short term collaboration** task is fully completed. The calculations for the scenario for Amazon are the following:

$$Trustworthy = 1, Shared R\&D assets = 2, Task = 1$$

$$\begin{aligned} Utility &= -1 \cdot Trustworthy + Task \cdot Shared R\&D assets \\ &= -1 \cdot 1 + 1 \cdot 2 \\ &= 1 \end{aligned}$$

For Microsoft the situation differs. Since the **long term collaboration** task requires long term collaboration from another actor as well, it is not completed. At the same time, Microsoft showed the intention to participate in long term collaboration which earns it some trust. Utility for Microsoft in this scenario will be the following:

$$Trustworthy = 1, Shared R\&D assets = 2, Task = 0$$

$$\begin{aligned} Utility &= 1 \cdot Trustworthy + Task \cdot Shared R\&D assets \\ &= 1 \cdot 1 + 0 \cdot 2 \\ &= 1 \end{aligned}$$

4.5.1.5 Yes-No scenario

In this scenario Amazon manages to complete **collect knowledge for short term collaboration** dependee via **improve core asset roadmapping** in Amazon RDS via **gather knowledge for DBaaS core asset roadmapping from the database roadmapping** via **Share roadmap** in Microsoft SQL actor.

This means that **one sided short term collaboration** is only 50% complete. The calculations for the scenario for Amazon are the following:

$$Trustworthy = 1, Shared R\&D assets = 2, Task = 0.5$$

$$\begin{aligned} Utility &= -1 \cdot Trustworthy + Task \cdot Shared R\&D assets \\ &= -1 \cdot 1 + 0.5 \cdot 2 \\ &= 0 \end{aligned}$$

For Microsoft, since **Long term collaboration** task was not completed, the outcome is 0.

4.5.1.6 No-Yes scenario

In this scenario Amazon completes **make collaboration agreement that meets short term goals** task via **long term collaboration** task in Microsoft actor.

This means that **one sided short term collaboration** is only 50% complete. The calculations for the scenario for Amazon are the following:

$$Trustworthy = 1, Shared R\&D assets = 2, Task = 0.5$$

$$\begin{aligned} Utility &= -1 \cdot Trustworthy + Task \cdot Shared R\&D assets \\ &= -1 \cdot 1 + 0.5 \cdot 2 \\ &= 0 \end{aligned}$$

For Microsoft the situation differs. Since the **long term collaboration** task requires long term collaboration from another actor as well, it is not

completed. At the same time, Microsoft showed the intention to participate in long term collaboration, which earns it some trust. Utility for Microsoft in this scenario will be the following:

$$Trustworthy = 1, Shared\ R\&D\ assets = 2, Task = 0$$

$$\begin{aligned} Utility &= 1 \cdot Trustworthy + Task \cdot Shared\ R\&D\ assets \\ &= 1 \cdot 1 + 0 \cdot 2 \\ &= 1 \end{aligned}$$

4.5.1.7 No-No scenario

In this scenario Amazon is denied it's **one sided short term collaboration** task. This means that **collect knowledge for short term collaboration areas** and **make collaboration agreement that meets short term goals** tasks were attempted, yet none of the succeeded. Hence, **trustworthiness** is being hurt, **shared R&D assets** are not being contributed to.

The values of the variables are the following:

$$Trustworthy = 1, Shared\ R\&D\ assets = 2, Task = 0$$

The outcomes for Amazon can be calculated by the following formula:

$$\begin{aligned} Utility &= -1 \cdot Trustworthy + Task \cdot Shared\ R\&D\ assets \\ &= -1 \cdot 1 + 0 \cdot 2 \\ &= -1 \end{aligned}$$

In this scenario Microsoft denies any interaction with Amazon so it's outcome is 0.

4.5.2 Cooperation

Cooperation scenario, where both companies try to maximize the utility yielded from the cooperation with each other. Utility of each company is measured by the amount of softgoals each company can achieve as a result, the more softgoals the better. A SR model with cooperation scenario

propagated labels Figure 4.12, a smaller model with only relevant actors and elements Figure 4.13, a game trees model for the cooperation scenario Figure 4.15.

The "unsquashed" model in Figure 4.14 has a number of new elements. Microsoft has a **No collaboration** task and a **Collaboration with Amazon** softgoal. Microsoft SQL actor has a **Don't share roadmap** and a **Share roadmap** tasks. **Product roadmap** resource is the result of the **Improve product roadmapping** task from the original SR model. **Collaborate with Amazon** softgoal is also introduced in this actor.

For this scenario, Amazon is chosen as a focal actor. Satisfaction of the **competitive** softgoal is of the highest importance for Amazon and Microsoft. Furthermore, **Long term collaboration** is critical to the overall strategy of Amazon.

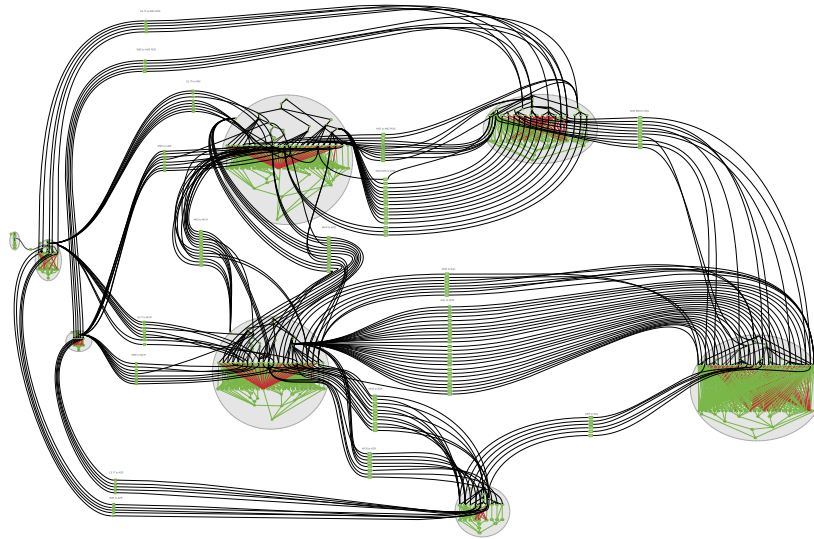


Figure 4.12: SR cooperation model. The labels in the Amazon and Microsoft actors show the goals to be satisfied.

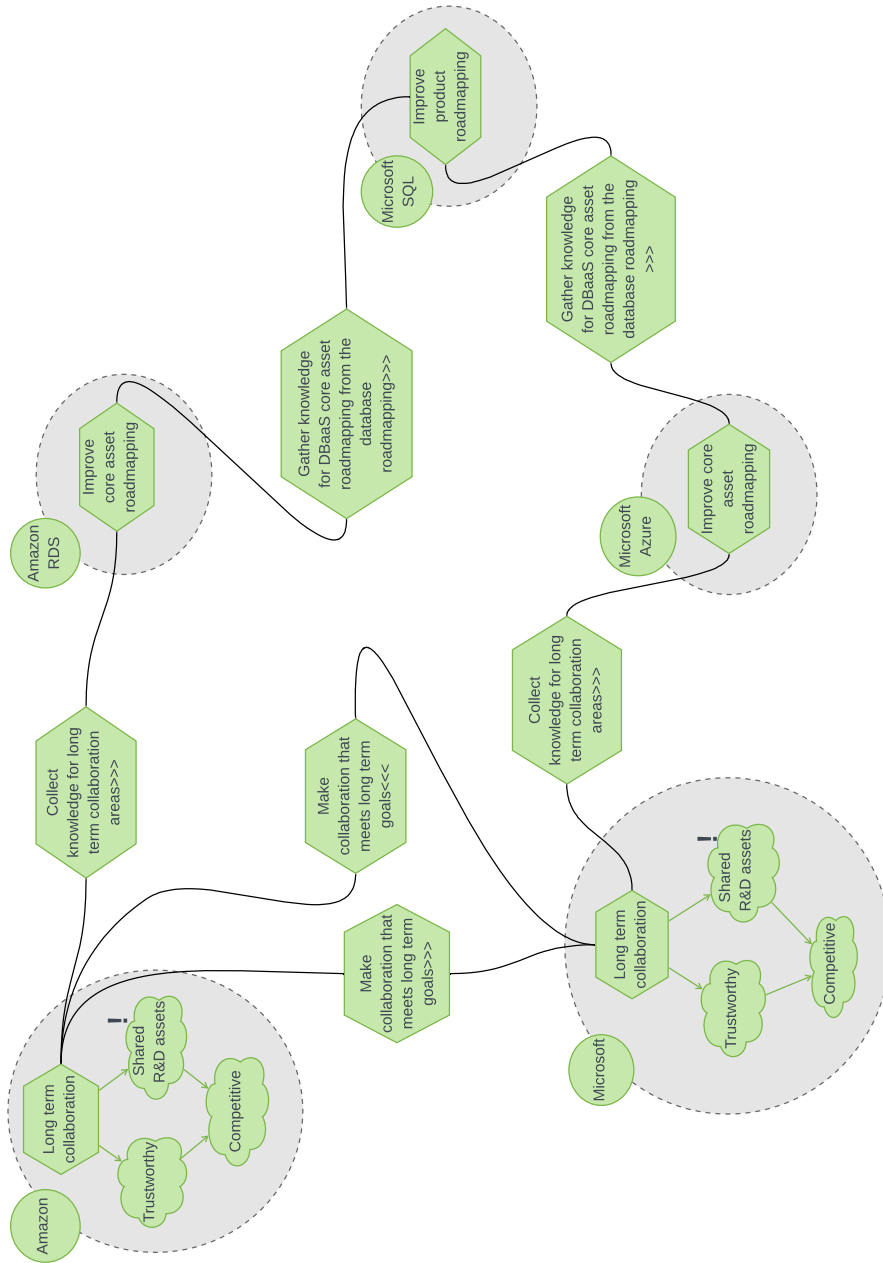


Figure 4.13: SR cooperation model with only relevant elements

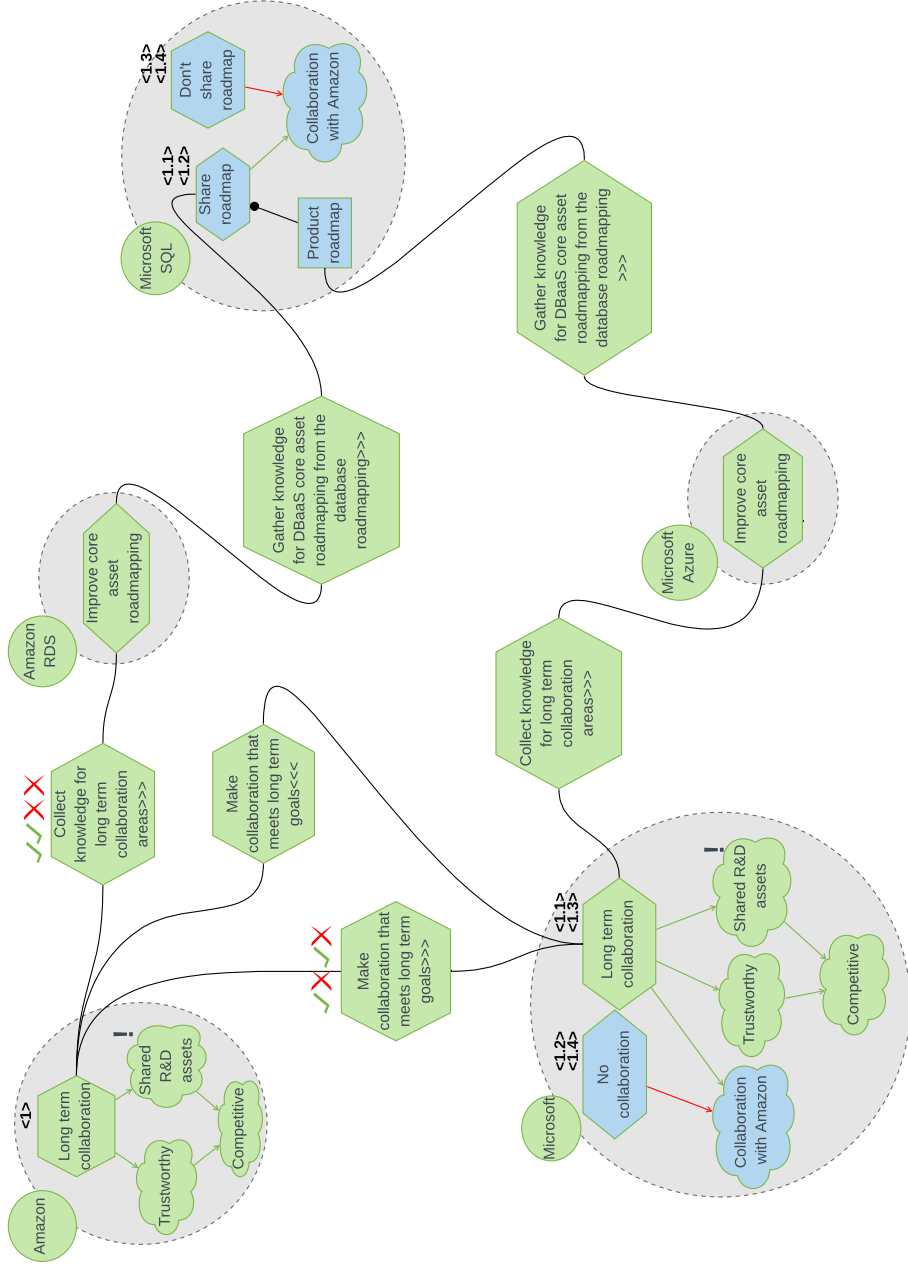


Figure 4.14: SR model for cooperation. Expanded with elements that allow better game tree modeling.

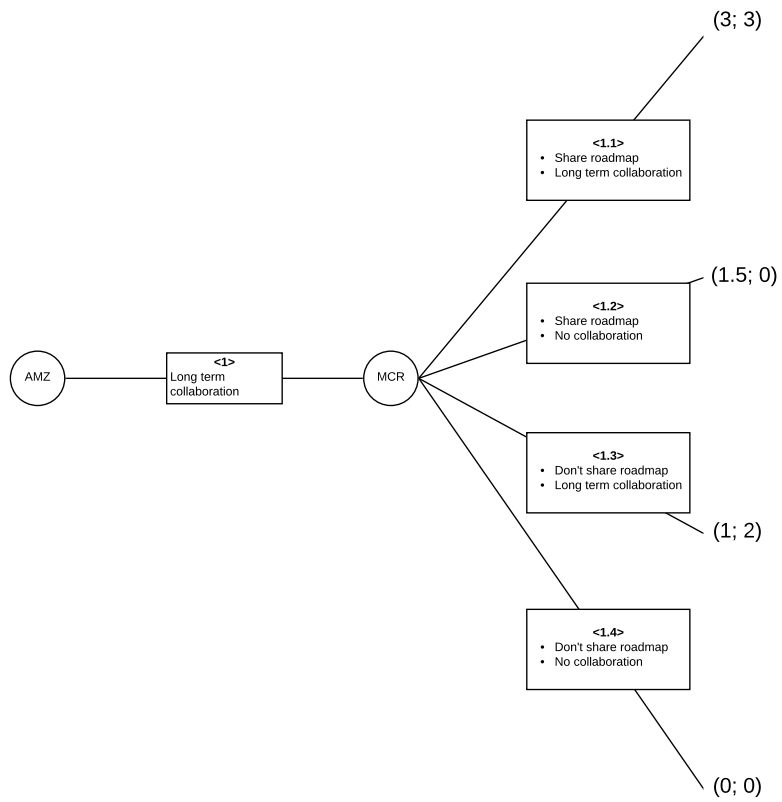


Figure 4.15: Game tree for cooperation scenario.

4.5.2.1 Amazon

Within the scope of the actor **Long term collaboration** is to be satisfied. This task helps the **trustworthy** and **shared R&D assets**.

The **long term collaboration** task depends on two different tasks: **collect knowledge for long term collaboration areas** and **make collaboration that meets long term goals**. **Collect knowledge for long term collaboration areas** as a dependee depends on the **improve core asset roadmapping** dependee element within Amazon RDS. **Make collaboration that meets long term goals** as a dependee depends on the **long term collaboration** dependee element within Microsoft.

4.5.2.2 Collect knowledge for long term collaboration areas

Collect knowledge for long term collaboration areas dependee depends on **improve core asset roadmapping** dependee element in Amazon RDS actor which depends on **gather knowledge for DBaaS core asset roadmapping from the database roadmapping** dependee which depends on **Share roadmap** dependee element in Microsoft SQL.

4.5.2.3 Make collaboration that meets long term goals

Make collaboration that meets long term goals dependee depends on **long term collaboration** dependee element in Microsoft actor.

4.5.2.4 Microsoft

For Microsoft **long term collaboration** task has two dependees: **make collaboration that meets long term goals** and **collect knowledge for long term collaboration areas**.

4.5.2.5 Make collaboration that meets long term goals

Make collaboration that meets long term goals dependee has a dependency on **long term collaboration** dependee element in Amazon actor.

4.5.2.6 Collect knowledge for long term collaboration areas

Collect knowledge for long term collaboration areas dependee depends on **improve core asset roadmapping** dependee element in Mi-

Microsoft Azure actor which depends on **gather knowledge for DBaaS core asset roadmapping from the database roadmapping** dependee which depends on **Product roadmap** dependee element in Microsoft SQL actor.

4.5.2.7 Yes-Yes scenario

In this scenario, Amazon and Microsoft completes all dependee tasks completely.

Amazon:

Collect knowledge for long term collaboration areas = 1
 Make collaboration that meets long term goals = 1
 Trustworthy = 1
 Shared R&D assets = 2

Microsoft:

Collect knowledge for long term collaboration areas = 1
 Make collaboration that meets long term goals = 1
 Trustworthy = 1
 Shared R&D assets = 2

However, since both **long term collaboration** tasks have a dependency on each other, to calculate their values a system of linear equations has to be solved:

Amazon's **long term collaboration**: x
 Amazon's **collect knowledge for long term collaboration areas**: c_1
 Microsoft's **long term collaboration**: y
 Microsoft's **collect knowledge for long term collaboration areas**: c_2

$$\begin{cases} x = \frac{y}{2} + \frac{c_1}{2} \\ y = \frac{x}{2} + \frac{c_2}{2} \end{cases} \equiv \begin{cases} x = 1 \\ y = 1 \end{cases}$$

After that the final utility for both actors can be calculated. Amazon:

$$\begin{aligned}Utility &= \textit{trustworthy} \cdot \textit{long term collaboration} \\ &+ \textit{shared R\&D assets} \cdot \textit{long term collaboration} \\ &= 1 \cdot 1 + 2 \cdot 1 \\ &= 3\end{aligned}$$

Same calculations can be applied to Microsoft, the result is $Utility = 3$.

4.5.2.8 Yes-No scenario

In this scenario **collect knowledge for long term collaboration areas** is satisfied, **make collaboration that meets long term goals** is not satisfied. This means that Amazon only has access to Microsoft SQL **Share roadmap** task results, based on which they have a collaboration with Microsoft. The values of the variables for Amazon are the following:

$$\textit{Trustworthy} = 1, \textit{Shared R\&D assets} = 2, \textit{Task} = 0.5$$

The utility for Amazon is calculated as following:

$$\begin{aligned}Utility &= (\textit{trustworthy} + \textit{Shared R\&D assets}) \cdot \textit{task} \\ &= (1 + 2) \cdot 0.5 \\ &= 1.5\end{aligned}$$

For Microsoft, since the **long term collaboration task is not satisfied**, $Utility = 0$.

4.5.2.9 No-Yes scenario

In this scenario, for Amazon, **collect knowledge for long term collaboration areas** is not satisfied, **make collaboration that meets long term goals** is satisfied. On the other hand, for Microsoft, **collect knowledge for long term collaboration areas** task is satisfied, but, as described above, the results of this task are not shared with Amazon.

Since both **long term collaboration** tasks have a dependency on each other, to calculate their values a system of linear equations has to be solved:

Amazon's **long term collaboration**: x
 Microsoft's **long term collaboration**: y
 Microsoft's **collect knowledge for long term collaboration areas**: c_1

$$\begin{cases} x = \frac{y}{2} \\ y = \frac{x}{2} + \frac{c_1}{2} \end{cases} \equiv \begin{cases} x = \frac{1}{3} \\ y = \frac{2}{3} \end{cases}$$

After that the utility of both actors can be calculated. The values of the variables for Amazon are the following:

$$Trustworthy = 1, Shared\ R\&D\ assets = 2, Task = \frac{1}{3}$$

Amazon:

$$\begin{aligned} Utility &= (trustworthy + Shared\ R\&D\ assets) \cdot task \\ &= (1 + 2) \cdot \frac{1}{3} \\ &= 1 \end{aligned}$$

Microsoft:

$$\begin{aligned} Utility &= (trustworthy + Shared\ R\&D\ assets) \cdot task \\ &= (1 + 2) \cdot \frac{2}{3} \\ &= 2 \end{aligned}$$

4.5.2.10 No-No scenario

In this scenario both **collect knowledge for long term collaboration areas** and **make collaboration that meets long term goals** tasks are not completed. The values of the variables for Amazon are the following:

$$Trustworthy = 1, Shared R\&D assets = 2, Task = 0$$

The utility for Amazon is calculated as following:

$$\begin{aligned} Utility &= (Trustworthy + Shared R\&D assets) \cdot Task \\ &= (1 + 2) \cdot 0 \\ &= 0 \end{aligned}$$

For Microsoft, since **long term collaboration** task is not completed as well, the final utility is also 0.

4.6 e3value model

This section describes the e3value model in Figure 4.16 created based on the SR models. The modeling procedure follows the guidelines in Figure 4.5 and Table 13. The scope of the model is similar to the scope of the SR models in the Section 4.5.

In the model the customer purchases DBaaS from Amazon for a certain fee. The customer represents SME and LE (with LE IT Department) since their behavior is similar.

Amazon is responsible for selling the DBaaS to the customer is this particular case. The DBaaS sold is Amazon RDS. Amazon exchanges values with Microsoft: purchasing Microsoft SQL Server for a fee and exchanging shared R&D resources. The purchased SQL Server will be used in the DBaaS sold to the customer in a form of Database Engine within Amazon RDS.

Another value exchange are the shared R&D resources. Amazon and Microsoft work together to create more advanced technologies, in this case it is assumed that a number of employees from both companies are assigned to work on a joint project.

The last value exchange that Amazon has is with Amazon RDS. Amazon provides it with a certain budget to get a better product in return.

Amazon RDS has a value exchange with Microsoft SQL where employees from both companies work together to improve the compatibility of those two products. This benefits both companies since Amazon RDS gets a better product and as a result Microsoft SQL gets resold via Amazon more often

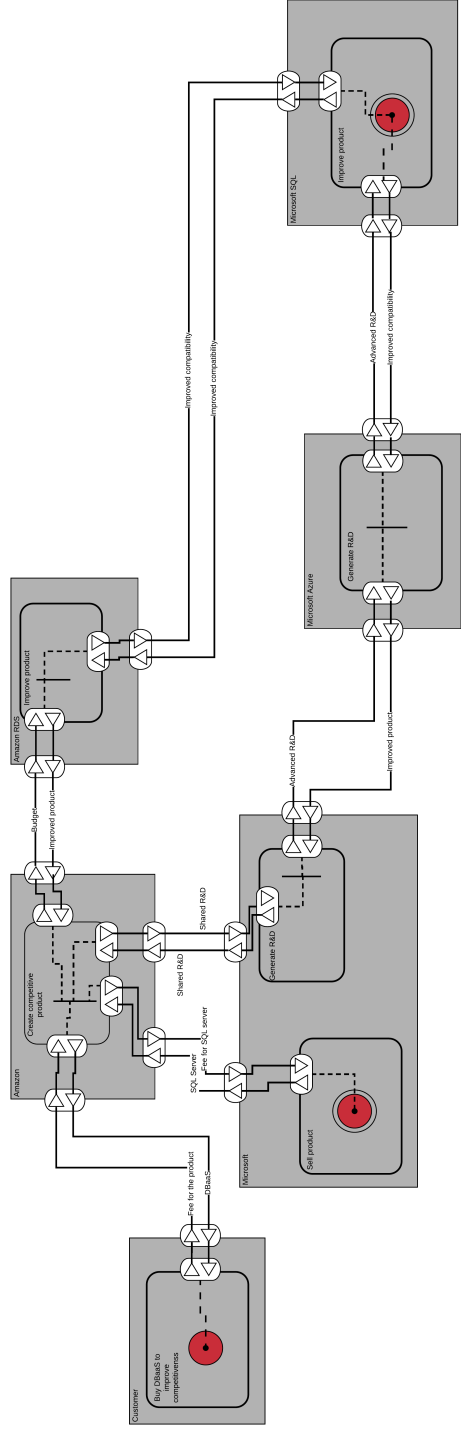


Figure 4.16: e3value model of a Customer, Amazon, Microsoft RDS, Amazon RDS, Microsoft Azure and Microsoft SQL

too. The two actors exchange man-hours spent working together on the compatibility of the products.

Microsoft has a value exchange with Microsoft Azure. In this scenario Microsoft uses R&D created together with Amazon to improve its own product: Microsoft Azure.

Finally, similar exchange takes place between Microsoft Azure and Microsoft SQL. Azure gives Microsoft SQL Advanced R&D, received from Microsoft and further enriched, and gets Improved Product in return.

Chapter 5

Results

In this section the results of the research are presented. First, the artifacts from the modeling section are revisited. This is done to explain the value of such artifacts in the context of research questions. Next, the modeling process is evaluated from the perspective of what parts of it are successful and what are not. Finally, some possible solutions to improving the modeling process are given.

5.1 Modeling results

This section describes the evaluation of the results of the modeling procedure.

5.1.1 Information gathering

Information gathering is satisfactory to create a model for this study. Gathered information had problems with completeness and level of detail. Main sources for information about Amazon and Microsoft were the documentations of the relevant products [58, 59] and the documents describing new features in the latest version of the product [60].

5.1.1.1 Completeness

The biggest issue when working with the documents describing the latest version of the product was the scope of those documents. While providing more complete overview of the product and giving a finer lever of granularity, the scope of such documents is limited to the upcoming release of the product

and does not contain any information about the attributes of the product from the previous versions.

One of the suggested solutions to mitigate the described problems is a series of interviews with the experts in the researched products. Due to the time and resource limitations of this research such interviews were not conducted, however are expected to yield very rich results. The interviews can be conducted with product managers, product owners for the overview of the product, information gathering for high level goals and tasks. As the level of granularity becomes finer, for software products interviews can be conducted with the development team to gather information about the attributes of the software product.

Another problem is determining the boundaries for each actor in the i* model. i* guidelines state that such decision lies on the person creating the model (the modeler), hence the overall completeness of the model is judged by the modeler as well. In this research the goal was to test the modeling guidelines, so it was sufficient to give an overview of the main activities of actors. However, in a real life situation the scope of the modeling can be changed to only document some of the activities of each actor. In that case, it is advised to create a document describing what activities of each actor are of interest for the modeling and then use this document as a guideline for setting the boundaries.

5.1.1.2 Level of detail

The biggest issue when working with the documentation of the product was the size of it. Within the research it was not feasible to study all documentation documents in detail, so the level of granularity for the functional and quality attributes was based on the summaries of the attributes provided in the documentations.

5.1.2 i* model

5.1.2.1 i* resulting model evaluation

The resulting model shows the relations between the actors, as well as the internal structure of the actors, of an "Amazon and Microsoft cloud services" case.

This model answers the RQ2, results being the SD and the SR models.

For the RQ3, because of the resource limitations the to-be relations model was not created. However, it is possible to create such model basing it on the existing models.

Overall structure of the SR model For the SD and the SR models the following boundaries were set for the participating actors: clients, companies, products of the companies. Those actors were chosen because of their proximity to Amazon and Microsoft. While the those two companies are of the biggest interest for this research, the clients and the products of the companies needed to be included as well.

Clients fulfill the function of showing how the companies act to satisfy clients' needs and how the companies adapt their behavior to different clients. Products of the companies are shown as the independent actors because they have a certain level of autonomy and their own set of goals, albeit those goals being set by the parent companies.

Overall structure of the actors Two level structure for goals and tasks: paper [61] describing software product management (SPM) activities and the refined goals and tasks. The SPM level is unrefined, yet because there was no other insight on how to categorize the refined goals and tasks it had to be used. The refined level is fairly detailed, yet the completeness (if it covers all relevant activities) is questionable because of the sources available.

5.1.2.2 i* modeling guidelines improvement

Current guidelines improvement The guidelines for creating a SD and SR i* models can be found in Table 11. While the majority of the guidelines were not changed, there are a few that were evaluated as the ones needed to be modified.

Use the "D" symbol notation to denote a Dependency link. During the modeling process this guideline was not followed due to the increase of difficulty of the modeling process and the perceived decreased readability of the model. The proposition is the change the style of the dependency link. A new style can be a "depender element → dependee" and a "dependee → dependee element" arrow of a new shape. Another option is

showing the dependency direction in the dependee element. The latter option was used for creating the SD and SR models within this work, because it was perceived to be more readable.

Avoid or minimize drawing intersecting Links and overlapping Links with other Links and elements' text. During the model creation it became obvious that it was impossible to avoid the overlapping lines altogether. This situation decreases the readability of the model, so the following recommendations were given to this guideline. If possible, avoid the intersection of the lines of different kinds, e.g. contribution link and refinement link. The intersection of different kinds of links clutters the model and makes the space designated to show the relations between the elements less readable.

Next, intersections between the lines of the same kind is allowed, but not recommended. While those intersecting lines decrease readability as well, the decrease is assumed to be smaller compared to the intersection of lines of the different kind.

Proposed new guidelines Furthermore, a number of new guidelines were proposed.

Dependum can be connected to the actor itself If it is not clear to what element in the Dependee the links point to, point the link to the actor. This way, a relation between the actors is preserved and in the future models a better refinement of the dependee can be done to make the link point to the dependee element.

Group dependums of the same Depender, Dependee and direction Following this guideline it would be easier to see all dependencies of one actor on another. In the created model, the groups were also given a title above them, stating the depender and the dependee.

Open and closed tasks concept Open tasks: the ones that are decomposed completely, they do not include any other tasks that are not described in the model. Closed tasks: the ones that are decomposed partially, in the model only a part of the subtasks are described. Further decomposition is possible, but is not done within the given model.

Structure the elements within actors To improve the readability of the model, it is suggested to place elements within an actor according to a certain structure. Within this work, placing the most refined elements – tasks and softgoals – in the center of the model, along the two parallel lines was the most useful guideline. This allowed to place a large amount of links between those refined elements and make those dependencies more readable. Another suggestion is to create levels of tasks, goals and softgoals. Those levels can start from the least or most refined elements and represent an item with the same amount of ancestors and descendants. Both approaches were tried within this research with the conclusion that both of them have positive and negative sides.

Same amount of ancestors gives a better overview of the decomposition of the top level goal, however the connection links to the most refined elements can become very long in the situation where there is a different number of refinement levels for different elements.

Another approach is to go bottom-up, where the elements have the same amount of descendants. In this situation the connection between the most refined elements and their ancestors is more readable, however links to the top level elements can become less readable. In a situation with a solo top level element within an actor, like in most actors in the models in this research, the latter approach was chosen, if it did not cause the unnecessary link overlaps, because with the single top level element the reader knows to what element each lower level element contributes to, so it is more important to show the connection between the most refined elements and their ancestors.

As a final note for this guideline, it is suggested to place the elements of the same level along the same line within the actor, if it does not interfere with any other guidelines.

Create tables to support SD and SR tables For large models with a lot of elements creating a number of supporting tables can be helpful. Those tables can provide information such as: further element description, the source for each element, connections between the elements. Not only those tables can make the modeling process more transparent and organized, but it can also serve as a foundation for future automation of some parts of the modeling process. The examples of such tables can be found in Section A, Section B, Section C.

5.1.3 Game trees model

5.1.3.1 Game trees resulting model evaluation

The resulting game trees are evaluated as satisfactory, since they provide the expected result. With those models, it is possible to see a sequence of moves each actor makes, as well as the outcomes of each sequence.

Calculating the outcomes comment The modeling guidelines used to create game trees model had a technique to calculate the outcomes for each actor. This technique was based on the principle that once the scenario is chosen for an actor, the labels are propagated to each relevant softgoal and the sum of those softgoals is the outcome. While this system provides a very simple way to calculate an outcome for a scenario, it also can lead to certain inaccuracies.

Such example can be found in the Subsection 4.5.1 and Subsection 4.5.2. There, two tasks have dependencies on each other and also on some other tasks. To make outcome calculation more accurate and formalized, a new calculation technique is proposed that allows to make calculations in more complicated cases, such as one described.

Interpreting the result Result interpretation activity is aimed to answer the question "What is the best sequence of moves for an actor?". If there is a sequence of moves that results in a positive outcome for each actor, then the answer is that sequence of moves. However, if the result is negative for at least one actor, it is a signal that an actor with a negative result has an incentive to alter the behavior to seek for a positive result for itself. In those situations, it is suggested to create a To-Be model based on the current model. The goal of the To-Be model is to create a situation, where a scenario with at least not negative outcomes for each actor is present. A number of activities that can help the creation of a new model can be found in the Figure 4.4 in the exploration phase.

5.1.3.2 Game trees modeling guidelines improvement

Current guidelines improvement The Guidelines for creating game trees models can be found in Table 12. The result was a positive evaluation of all guidelines. The only guideline that was modified was a "Rarely and in some cases an Edge can be used to connect the same Player if the same Player

makes consecutive moves”. It is proposed to avoid the technique in the guideline and instead to show the consecutive moves of the same player into one node in the model. This is aimed to increase the readability of the model and make it more compact, while not leaving out any information.

Proposed new guidelines The proposed new guidelines describe the technique of working with the scenario models, introduced in Section 4.5. The main idea behind the scenario SR model is making the main SR model more readable and the creation of the game trees model faster. Increased readability of the main SR model is achieved by omitting or ”squashing” the elements such as tasks into one task. By reducing the amount of elements the main SR model becomes more readable. The disadvantage of this technique is that requires steps to be taken to choose a part of the main model to work with and then to enrich the chosen part with elements necessary for the game trees modeling. The decision whether to use this technique or not should be made by the modeler if necessary.

5.1.4 e3value model

5.1.4.1 e3value model evaluation

The resulting e3value models are evaluated as satisfactory, since they provide the expected result. With those models, it is possible to see what values are being transferred between the actors.

For the RQ3, because of the resource limitations the to-be relations model was not created. However, it is possible to create such model basing it on the existing models.

5.1.4.2 e3value model guidelines improvement

Current guidelines improvement The guidelines for creating an e3value model can be found in Table 13. The result of the evaluation was to keep all existing guidelines as they are. Furthermore, a number of the guidelines were not evaluated due to the fact that they describe the techniques for the to-be model creation. Since those models were not created, it was decided to omit the evaluation of those guidelines. Information about the evaluated guidelines can be found in Table 13 in the ”Evaluation” column.

5.2 Recommendation to companies

This section describes the recommendations that can be provided to the companies based on the Figure 4.11 and Figure 4.15. Both companies benefit most from the long term collaboration, **Long term collaboration** → **Share roadmap + Long term collaboration**. However, in some situations actors do not exercise rational behavior. In the described cases, Microsoft can become a victim of Amazon if Amazon decides to exercise **One sided short term collaboration** task. To Microsoft, this task is indistinguishable from the **Long term collaboration** until after the moment Microsoft agrees to collaboration.

A few recommendations to resolve this coordination problem can be given. The first one is to collaborate with the other company in stages. That means that not all resources will be shared with the other company from the beginning of the collaboration, so the opportunistic company would not have as much resources to steal from the other company, albeit the outcome in case of the successful collaboration would be limited.

The other approach is to penalize the company exercising opportunistic behavior. This can be done by making an agreement between two companies that also describes the default rule where the company breaching the collaboration agreement would have to compensate to the other company. This option can lower the total outcome of successful collaboration due to the legal and other costs, yet can decrease the chances of opportunistic behavior.

Finally, increasing the value of the reputation can reduce the probability of opportunistic behavior of actors. A possible approach to that is creating and growing collaboration efforts between more than two companies. As a result, this collaboration will yield more utility for each company involved in form of R&D assets, making it more attractive to participate in. At the same time, companies involved in this collaboration can make entry rules more strict, thus increasing the importance of trustworthy reputation for other companies interested in developing R&D assets together.

Chapter 6

Discussion

6.1 Quality of created models

The quality of the created models is evaluated as satisfactory in the context of the research. However, those models have a number of flaws when reflecting the real world situation.

6.1.1 Quality of source material

The quality of the source materials used for this research does not necessarily reflect the real relations between the companies. The source materials fall in one of the two categories: academic literature and documentation provided by the company.

Academic literature provided a structured, yet quite generalized overview of the companies. Furthermore, the academic literature lacked the detailed description of the features of the companies' products.

Technical documentation provided by the companies, on the other hand, provided detailed information on products on the company. However, one of the issues with the documentation is that some of the documents used were only available as a description of the upcoming version of the product. This type of documents would contain the descriptions of functional and quality attributes of the upcoming version of the product. This means that it is likely that at least some of the present attributes of the products were left out. During the work with the full documentation of the product another issue occurred. There is a high chance that a document of this type would be 1000 pages long or more. Working with those documents is a very time

intensive task because of the amount of information contained within them that is not of interest for the research.

6.1.2 Boundaries

Setting the boundaries for the creation of the i^* models is an issue recognized by a number of articles. Within this research, the boundaries were set so that Amazon and Microsoft would have immediate relations with other actors with a goal to show the cooperative nature of their relations. This led to the creation of the model that had this kind of relationship, so the boundaries set can be evaluated as satisfactory.

However, when modeling the same situation – Amazon and Microsoft – for a different goal, other boundaries can be set. Since there are no concrete guidelines on how to set the boundaries for the model, the resulting models are dependent on the experience and expertise of the modeler or the modeling team.

6.1.3 Degree of refinement

Once the boundaries for the model are set, it is important to set the degree of refinement for the model. Refinement in this context means how detailed the elements with the model, namely goals, tasks and softgoals should be decomposed. As with the boundaries, there are no clear guidelines dictating how this level should be set, so it is very dependent on the experience and expertise of the modeler.

6.1.4 Priorities for the softgoals

When creating a game trees model, priorities need to be set for the softgoals in the i^* model. Within this work the priorities were set based on the evaluation by a product owner and a software engineer. Since those experts did not work in any of the researched companies, the evaluations can be inaccurate. An interview with an employee working on the modeled product is expected to yield much more accurate results.

Another issue with the priorities is that there are no rigid guidelines on how to set the weights for softgoals. This means that the actual weight of each evaluated softgoal is very inaccurate and only indicates the relative

importance of it to another softgoal, which can lead to inaccuracies when computing the outcomes of the scenarios in the game trees.

6.1.5 Adoption of the models

There are a number of factors that can contribute to the adoption of the method and models used by the managers working at the companies involved with SECO. First, the ease of use and small amount of time needed to learn how to use and create the models. Second, the created models are easy to read and can be used as a graphical material during the presentations or meetings. Third, yielded results can be used in the decision making process regarding the relationships of the company with other companies within the SECO. The results, however, need to be computed. Even though an approach to calculate the results is suggested within this work, there is a possibility it can be challenging and time consuming for a modeler. To overcome this, a system aimed to automate the calculation of the outcomes can be created.

On the other hand, there is also a number of factors that can prevent those models from being adopted. Firstly, the readability of the models can suffer if the models become too big. The amount of elements and the dependencies between them is the main reason for that. Next, the amount of time needed to create the models, especially Strategic Dependency and Strategic Rationale, can also be large if the model needs to be very detailed.

6.2 To-be model

Due to the time limitations of this research the to-be models (i^* , game trees and $e3value$) were not created. However, the used guidelines give a set of steps that can be taken to create a to-be with improved aspects compared to the as-is model.

Chapter 7

Conclusions and future work

7.1 Conclusions

This work was aimed to answer the research questions defined in the Chapter 1.

7.1.1 State of modeling methods in SECO

This research question was answered in Chapter 3. For the purpose of creation of an overview of the competition in SECO it is proposed to use an i^* model. For choosing the most beneficial strategy it is suggested to use game trees and the technique provided for the calculation of the outcomes of each strategy. To visualize a value exchange, it is recommended to use a e3value model.

One flaw of those models and the methods used to create the models is a dependency on the modeler, as well as modeler's experience and expertise. Due to the lack of formalized guidelines on the certain aspects of the model, such as boundaries and completeness, different modelers can produce different models of the same situation.

7.1.2 Results of the proposed method

The proposed guidelines are sufficient for the creation of the as-is model. The resulting models, as well as the model creation process can be found in Chapter 4. i^* models provide an overview of the competition within the SECO, game trees models give more specified information about the possible

outcomes for each actors after they make a sequence of moves, while e3value models show what values are being exchanged between actors. This way, the situation can be presented in a very comprehensive way in an i* notation, which can be learned by a non expert quickly. Then, based on the outcomes for the situation can be calculated to show the reasoning behind the actions of each actor and the outcomes of the actions. This provides a solid foundation for future analysis on the to-be model, which is a model that is aimed to improve the utility gain of one or all actors.

While the time limitations of this research did not allow to create a to-be model, there is a very strong expectation that using the proposed guidelines can provide a to-be model, where at least the target actor improves it's utility gain.

7.1.3 Improvements to the proposed method

Chapter 5 and Chapter 6 provides information about the improvements that can be done to the guidelines. Overall, it is suggested to create more concrete guidelines for the information gathering process. Next, i* some guidelines are proposed to be changed to improve the readability of the model and to make the model creation process more concrete when it comes to the modeling of actors. For game trees, the most notable improvement is the more formal way to calculate the outcomes of the scenarios.

7.2 Future work

7.2.1 Priorities for the softgoals

Creating a more formalized method for evaluating the softgoals is an important part of the future work. This will allow to make a step towards calculating the scenarios based on how much each softgoals contributes to the set goal, instead of calculating the outcomes based on how important the softgoals are compared to each other.

7.2.2 Automating the model

Automating the model creation is also a promising direction of the future work. The most obvious areas for automation are creation of game trees

models and e3value models based on the i^* models. Those automation tasks are not expected to be very difficult, since they are based on transforming the data stored in the i^* model into the game tree model and e3value model.

Another area for automation is the calculation of the outcomes for the game trees models. This is a very straightforward task, since as the game tree is created, only a formula proposed in this research needs to be used to calculate the outcomes.

7.2.3 Improvement of readability

During the creation of the SR model, one of the biggest issue was the readability and the usability of the model. The amount of intersecting lines, as well as the amount of elements make the model very difficult to read. While no obvious direction for solving this problem can be suggested, the improvement of this aspect of the model is of a critical level, since the resulting models of a certain size can be completely unreadable and unusable.

7.2.4 Creation of the to-be model

Due to the fact that this research did not feature a to-be model, this remains an another direction for the future research. For the to-be model, there are a number of questions that can be researched. First, is it possible to create a to-be model based on the as-is model, without applying any stimulus to the model. That means, is it possible to create a model of relationships that the actors will have in the future if none of the actors change their behavior. The model can still change, due to the fact that the present actors can leave the model e.g. due to the bankruptcy. Second, is it possible to create a to-be model while maximizing the outcome of a given actor. This task would be of the biggest use for the companies that aim to maximize the completion of their goals. Third, is it possible to create a to-be model that increases the outcome of all actors involved. While this task is important, because while the second question can lead the company to the scenario where it maximizes it's utility, the proposed scenario can be not the most stable one. This question aims to add stability to the model, thus increasing the long term utility gain for an actor.

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Appendices

A Strategic rationale model sources

N.B. In this section "I&E" in the "Source" column means interpolation and extrapolation based on the other sources provided in the table.

Table 1: Strategic rationale sources for Amazon. The sources are Interpolation & Extrapolation (I&E) based on [62, 63, 64, 65, 66] if not stated otherwise.

Element	Type	Description	Source
Company be competitive	Goal	...	I&E
Manage portfolio effectively	Task	...	[61]
Portfolio management be effective	Goal	...	[61]
Make profit	Task	...	I&E
Make market analysis	Task	...	[61]
Perform product life cycle management	Task	...	[61]
Do partnering & contracting	Task	...	[61]
Market analysis be made	Goal	...	[61]
Product life cycle management be performed	Goal	...	[61]
Partnering & contracting be done	Goal	...	[61]
Identify market trends	Task	...	[61]
Make a market strategy	Task	...	[61]
Analyze customer win/loss	Task	...	[61]
Analyze competitors	Task	...	[61]
Analyze product life cycle	Task	...	[61]
Decide on portfolio innovation	Task	...	[61]
Analyze portfolio scope	Task	...	[61]
Analyze business case	Task	...	[61]
Product development	Task	Development of private assets	I&E
Develop product lines	Task	...	[61]
Develop service level agreements	Task	...	[61]
Manage intellectual property	Task	...	[61]
Investigate distribution channels	Task	...	[61]
Establish and evaluate pricing model	Task	...	[61]
Sell available products	Task	...	I&E
Intellectual property be managed	Goal	...	I&E
Products be sold	Goal	...	I&E
R&D collaboration with a partner	Task	...	I&E
No R&D collaboration	Task	...	I&E
Resell from partner	Task	...	I&E
Cosell with partner	Task	...	I&E
R&D collaboration be present	Goal	...	I&E
No R&D collaboration be present	Goal	...	I&E
Resell be with partner	Goal	...	I&E
Cosell be with partner	Goal	...	I&E
Long term collaboration	Task	A type of collaboration that aims to be sustained over long period of time. Significant payoff in the long run, yet requires a significant amount of R&D yield sharing with the partner.	I&E
One sided short term collaboration	Task	A type of collaboration that aims to create the biggest possible R&D yield in the short run. Sharing R&D yield with the partner is undesirable, the priority of the relation is to at least become a freeloader, at most – steal the R&D results of the other company.	I&E

Table 1: Continued

Element	Type	Description	Source
Develop own product	Task	...	I&E
Make acquisition	Task	...	I&E
Sell product as is	Task	Sell Microsoft SQL server, without the service, only the local distribution.	I&E
Sell partner product and own products as a bundle	Task	...	I&E
Sell directly competitive product	Task	...	I&E
Sell complimentary product	Task	...	I&E
Sell partner product and own product as a bundle be present	Goal	...	I&E
Complimentary product be sold	Goal	...	I&E
Offer DBaaS	Task	...	I&E
Offer IAAS	Task	...	I&E
Effective DBaaS management	Softgoal	...	I&E
Effective IAAS management	Softgoal	...	I&E
Complimentary product generates revenue	Softgoal	...	I&E
A lot of available resources	Softgoal	The amount of resources the company possesses that can be used to perform business processes. Those resources include, but not limited to employees man hours, liquid finance resources, etc.	I&E
Shared R&D assets	Softgoal	R&D assets that are developed and shared by several actors on the market	I&E
Sufficient R&D budget	Softgoal	...	I&E
Acquisition capabilities	Softgoal	...	I&E
Partner's product generates revenue	Softgoal	...	I&E
Effective cloud product management	Softgoal	...	I&E
Directly competitive product generates revenue	Softgoal	...	I&E
Products are synergistic	Softgoal	...	I&E
Trustworthy	Softgoal	How much trust other companies put into the company to uphold agreements.	I&E
Shared R&D assets	Softgoal	Assets, that are available to at least one more actor on the market	I&E
Acquired R&D assets	Softgoal	Assets, that were originally owned by another actor, but have been acquired by the company	I&E
Effective development department	Softgoal	...	I&E
Reselling strategy is profitable	Softgoal	...	I&E
Coselling strategy is profitable	Softgoal	...	I&E
Up to date market trends	Softgoal	...	[61]
Up to date market strategy	Softgoal	...	[61]
Analysis of customer win/loss	Softgoal	...	[61]
Analysis of competitors	Softgoal	...	[61]
Product life cycle	Softgoal	...	[61]
Portfolio innovation decision	Softgoal	...	[61]
Portfolio scope analysis	Softgoal	...	[61]
Business case analysis	Softgoal	...	[61]
Own product be well developed	Softgoal	...	I&E
Product line development	Softgoal	...	[61]
Service level agreements	Softgoal	...	[61]
Accessible R&D assets	Softgoal	All assets, that are accessible by the company and that can be used for development	I&E
Intellectual property management	Softgoal	...	[61]
Distribution channels investigation	Softgoal	...	[61]
Established and evaluated pricing model	Softgoal	...	[61]
Monitored partner network	Softgoal	...	[61]
Up to date market analysis	Softgoal	...	[61]

Table 1: Continued

Element	Type	Description	Source
Effective product life cycle management	Softgoal	...	[61]
Own R&D assets	Softgoal	Assets, available only to the company	I&E
Effective partnering & contracting	Softgoal	...	[61]
Effective portfolio management	Softgoal	...	[61]
Profitable	Softgoal	...	I&E
Competitive	Softgoal	...	I&E

Table 2: Strategic rationale sources for Amazon RDS

Element	Type	Description	Source
Product be competitive	Goal	...	I&E
Improve roadmap intelligence	Task	Prescriptions to the roadmap that answer the question "What the product should be like in the future?"	[61]
Roadmap intelligence be improved	Goal	Prescriptions to the roadmap that answer the question "What the product should be like in the future?"	[61]
Analyze products	Task	A combination of "Make product analysis" and "Make a partner roadmap" activities. Product analysis is an activity aimed to determine the weak and the strong aspects of the product, both technical and functional. Make a partner roadmap is an activity that creates a roadmap of what the partners would be developing in the future.	[61]
Analyze trends	Task	A combination of "Analyze society trends", "Analyze technology trends" and "Analyze competition trends" activities. Society trends is an overview of the big picture of important trends in society in the coming years. Technology trends is an overview of the big picture of important developments in terms of technology in the coming years. Competition trends is an overview showing what competing product are doing in terms of their product development in the coming years.	[61]
Improve product roadmapping	Task	Activities and plans related to product development that optimize the resources to create a product described in the "Improve roadmap intelligence" activity.	[61]
Improve core asset roadmapping	Task	...	[61]
Improve the marketing strategy	Task	...	I&E
Product roadmapping be improved	Goal	Activities and plans related to product development that optimize the resources to create a product described in the "Improve roadmap intelligence" activity.	[61]
Product roadmapping be improved	Goal	...	[61]
Marketing strategy be improved	Goal	...	I&E
Implement free trials policy	Task	More than 60 AWS products can be tried for free by all AWS customers.	[67]
Implement flexible pricing model	Task	Flexible pricing model includes billing for AWS services depending on the amount of resources used, not just the flat rate for the access to the service.	[67]
Implement "Bring your own license" policy	Task	Amazon can implement a practice, similar to Microsoft's BYOL (Bring Your Own License) policy, where the customer in given a discount or is only charged for the service used if the customer already has a license for the copy of the product the service offers access to.	Suggestion
Improve functional attributes	Task	...	I&E
Improve quality attributes	Task	...	I&E
Functional attributes be improved	Goal	...	I&E
Quality attributes be improved	Goal	...	I&E
Implement integration with machine learning tools	Task	Text stored in the database can be automatically translated and/or enriched with advanced Amazon AI services, e.g. topics, key phrases, translate, and many other functions can be applied to the natural text.	[68]
Implement monitoring function	Task	Monitoring function allows to collect data about Amazon RDS instance regarding it's various aspects, such as: reliability, availability, performance.	[58]
Improve resilience	Task	...	[58]
Implement advanced security	Task	...	[58]
Improve interoperability	Task	...	[58]
Resilience be improved	Goal	...	[58]
Advanced security be implemented	Goal	...	[58]
More databases be supported	Goal	...	[58]
Support failover	Task	In the event of a planned or unplanned outage of your DB instance, Amazon RDS automatically switches to a standby replica in another Availability Zone if you have enabled Multi-AZ. Amazon RDS handles failovers automatically so you can resume database operations as quickly as possible without administrative interventions.	[58]

Table 2: Continued

Element	Type	Description	Source
Support replication	Task	Amazon RDS uses the MariaDB, MySQL, Oracle, and PostgreSQL DB engines' built-in replication functionality to create a special type of DB instance called a Read replica from a source DB instance. You can reduce the lead on your source DB instance by routing read queries from your application to the Read Replica. Using Read Replicas, you can elastically scale out beyond the capacity constraints of a single DB instance for read-heavy database workloads.	[58]
Support backup and restore	Task	Amazon RDS creates and saves automated backups of your DB instance. Amazon RDS creates a storage volume snapshot of your DB instance, backing up the entire DB instance and not just individual databases. Then, a DB instance can be created by restoring from a DB snapshot.	[58]
Implement identity and access management	Task	Identity and Access Management (IAS) administrators control who can be authenticated and authorized to use Amazon RDS resources.	[58]
Implement data protection	Task	Amazon RDS conforms to the AWS shared responsibility model, where AWS is responsible for protecting the global infrastructure that runs all the AWS services. AWS customers are responsible for any personal data that they put in the AWS Cloud. To protect such data, a number of tools are offered by AWS and a number of guidelines containing best practices for data protection are provided by AWS. Such tools and guidelines include, but not limited to: use of multi-factor authentication with each account, use of SSL/TLS to communicate with AWS resources, set up API and user activity logging with AWS CloudTrail, use AWS encryption solutions, and use advanced managed security services such as Amazon Macie, which assists in discovering and securing personal data that is stored in Amazon S3.	[58]
Support Microsoft SQL	Task	Support of Microsoft SQL database engine.	[58]
Support MySQL, MariaDB, PostgreSQL, Oracle	Task	Support of MySQL, MariaDB, PostgreSQL, Oracle databases	[58]
Support Amazon Aurora	Task	Support of Amazon Aurora database engine.	[58]
Improve efficiency	Task	Improve efficiency in both time and other resources with which the product can perform operations	[27]
Improve simplicity	Task	Improve simplicity of the system, both in how the system is built, how easy it is to set up the system and how easy it is for user to use the system.	[27]
Failover be supported	Softgoal	In the event of a planned or unplanned outage of your DB instance, Amazon RDS automatically switches to a standby replica in another Availability Zone if you have enabled Multi-AZ. Amazon RDS handles failovers automatically so you can resume database operations as quickly as possible without administrative interventions.	[58]
Replication be supported	Softgoal	Amazon RDS uses the MariaDB, MySQL, Oracle, and PostgreSQL DB engines' built-in replication functionality to create a special type of DB instance called a Read replica from a source DB instance. You can reduce the lead on your source DB instance by routing read queries from your application to the Read Replica. Using Read Replicas, you can elastically scale out beyond the capacity constraints of a single DB instance for read-heavy database workloads.	[58]
Backup and restore be supported	Softgoal	Amazon RDS creates and saves automated backups of your DB instance. Amazon RDS creates a storage volume snapshot of your DB instance, backing up the entire DB instance and not just individual databases. Then, a DB instance can be created by restoring from a DB snapshot.	[58]
Identity and access management be implemented	Softgoal	Identity and Access Management (IAS) administrators control who can be authenticated and authorized to use Amazon RDS resources.	[58]

Table 2: Continued

Element	Type	Description	Source
Data protection be implemented	Softgoal	Amazon RDS conforms to the AWS shared responsibility model, where AWS is responsible for protecting the global infrastructure that runs all the AWS services. AWS customers are responsible for any personal data that they put in the AWS Cloud. To protect such data, a number of tools are offered by AWS and a number of guidelines containing best practices for data protection are provided by AWS. Such tools and guidelines include, but not limited to: use of multi-factor authentication with each account, use of SSL/TLS to communicate with AWS resources, set up API and user activity logging with AWS CloudTrail, use AWS encryption solutions, and use advanced managed security services such as Amazon Macie, which assists in discovering and securing personal data that is stored in Amazon S3.	[58]
Microsoft SQL be supported	Softgoal	Support of Microsoft SQL database engine.	[58]
MySQL, MariaDB, PostgreSQL, Oracle be supported	Softgoal	Support of MySQL, MariaDB, PostgreSQL, Oracle databases	[58]
Amazon Aurora	Softgoal	Support of Amazon Aurora database engine.	[58]
Competitive efficiency	Softgoal	The efficiency of the service is competitive compared to other products on the market.	[27]
Competitive simplicity	Softgoal	The simplicity of the service is competitive compared to other products on the market.	[27]
Integration with machine learning tools be implemented	Softgoal	Text stored in the database can be automatically translated and/or enriched with advanced Amazon AI services, e.g. topics, key phrases, translate, and many other functions can be applied to the natural text.	[68]
Monitoring function be implemented	Softgoal	Monitoring function allows to collect data about Amazon RDS instance regarding it's various aspects, such as: reliability, availability, performance.	[58]
Competitive level resilience	Softgoal	...	[58]
Advanced security is implemented	Softgoal	...	[58]
Large variety of databases is supported	Softgoal	...	[58]
Competitive functional attributes	Softgoal	...	I&E
Competitive quality attributes	Softgoal	...	I&E
Free trials policy is implemented	Softgoal	More than 60 AWS products can be tried for free by all AWS customers.	[67]
Flexible pricing model is implemented	Softgoal	Flexible pricing model includes billing for AWS services depending on the amount of resources used, not just the flat rate for the access to the service.	[67]
"Bring your own license" policy is implemented	Softgoal	Amazon can implement a practice, similar to Microsoft's BYOL (Bring Your Own License) policy, where the customer in given a discount or is only charged for the service used if the customer already has a license for the copy of the product the service offers access to.	Suggestion
Good roadmap intelligence	Softgoal	Prescriptions to the product that answer the question "What should product be in the future?"	[61]
Products are well analyzed	Softgoal	...	[61]
Trends are well analyzed	Softgoal	...	[61]
Good software product roadmap	Softgoal	...	[61]
Competitive marketing strategy	Softgoal	...	I&E
Competitive product	Softgoal	...	I&E

Table 3: Strategic rationale sources for Microsoft. The sources are Interpolation & Extrapolation (I&E) based on [62, 63, 64, 65, 66] if not stated otherwise.

Element	Type	Description	Source
Company be competitive	Goal	...	I&E
Manage portfolio effectively	Task	...	[61]
Portfolio management be effective	Goal	...	[61]
Make profit	Task	...	I&E
Make market analysis	Task	...	[61]
Perform product life cycle management	Task	...	[61]
Do partnering & contracting	Task	...	[61]
Market analysis be made	Goal	...	[61]
Product life cycle management be performed	Goal	...	[61]
Partnering & contracting be done	Goal	...	[61]
Identify market trends	Task	...	[61]
Make a market strategy	Task	...	[61]
Analyze customer win/loss	Task	...	[61]
Analyze competitors	Task	...	[61]
Analyze product life cycle	Task	...	[61]
Decide on portfolio innovation	Task	...	[61]
Analyze portfolio scope	Task	...	[61]
Analyze business case	Task	...	[61]
Product development	Task	Development of private assets	I&E
Develop product lines	Task	...	[61]
Develop service level agreements	Task	...	[61]
Manage intellectual property	Task	...	[61]
Investigate distribution channels	Task	...	[61]
Establish and evaluate pricing model	Task	...	[61]
Sell available products	Task	...	I&E
Intellectual property be managed	Goal	...	I&E
Products be sold	Goal	...	I&E
R&D collaboration with a partner	Task	...	I&E
No R&D collaboration	Task	...	I&E
Resell from partner	Task	...	I&E
Cosell with partner	Task	...	I&E
R&D collaboration be present	Goal	...	I&E
No R&D collaboration be present	Goal	...	I&E
Resell be with partner	Goal	...	I&E
Cosell be with partner	Goal	...	I&E
Long term collaboration	Task	A type of collaboration that aims to be sustained over long period of time. Significant payoff in the long run, yet requires a significant amount of R&D yield sharing with the partner.	I&E
One sided short term collaboration	Task	A type of collaboration that aims to create the biggest possible R&D yield in the short run. Sharing R&D yield with the partner is undesirable, the priority of the relation is to at least become a freeloader, at most – steal the R&D results of the other company.	I&E
Develop own product	Task	...	I&E
Make acquisition	Task	...	I&E
Sell product as is	Task	Sell Amazon product	I&E
Sell partner product and own products as a bundle	Task	...	I&E
Sell directly competitive product	Task	...	I&E

Table 3: Continued

Element	Type	Description	Source
Sell complimentary product	Task	...	I&E
Sell partner product and own product as a bundle be present	Goal	...	I&E
Complimentary product be sold	Goal	...	I&E
Offer DBaaS	Task	...	I&E
Offer IAAS	Task	...	I&E
Effective DBaaS management	Softgoal	...	I&E
Effective IAAS management	Softgoal	...	I&E
Complimentary product generates revenue	Softgoal	...	I&E
Shared R&D assets	Softgoal	R&D assets that are developed and shared by several actors on the market	I&E
Sufficient R&D budget	Softgoal	...	I&E
Acquisition capabilities	Softgoal	...	I&E
Partner's product generates revenue	Softgoal	...	I&E
Effective cloud product management	Softgoal	...	I&E
Directly competitive product generates revenue	Softgoal	...	I&E
Products are synergistic	Softgoal	...	I&E
Trustworthy	Softgoal	How much trust other companies put into the company to uphold agreements.	I&E
Shared R&D assets	Softgoal	Assets, that are available to at least one more actor on the market	I&E
Acquired R&D assets	Softgoal	Assets, that were originally owned by another actor, but have been acquired by the company	I&E
Effective development department	Softgoal	...	I&E
Reselling strategy is profitable	Softgoal	...	I&E
Coselling strategy is profitable	Softgoal	...	I&E
A lot of available resources	Softgoal	The amount of resources the company possesses that can be used to perform business processes. Those resources include, but not limited to employees man hours, liquid finance resources, etc.	I&E
Up to date market trends	Softgoal	...	[61]
Up to date market strategy	Softgoal	...	[61]
Analysis of customer win/loss	Softgoal	...	[61]
Analysis of competitors	Softgoal	...	[61]
Product life cycle	Softgoal	...	[61]
Portfolio innovation decision	Softgoal	...	[61]
Portfolio scope analysis	Softgoal	...	[61]
Business case analysis	Softgoal	...	[61]
Own product be well developed	Softgoal	...	I&E
Product line development	Softgoal	...	[61]
Service level agreements	Softgoal	...	[61]
Accessible R&D assets	Softgoal	All assets, that are accessible by the company and that can be used for development	I&E
Intellectual property management	Softgoal	...	[61]
Distribution channels investigation	Softgoal	...	[61]
Established and evaluated pricing model	Softgoal	...	[61]
Monitored partner network	Softgoal	...	[61]
Up to date market analysis	Softgoal	...	[61]
Effective product life cycle management	Softgoal	...	[61]
Own R&D assets	Softgoal	Assets, available only to the company	I&E
Effective partnering & contracting	Softgoal	...	[61]
Effective portfolio management	Softgoal	...	[61]
Profitable	Softgoal	...	I&E
Competitive	Softgoal	...	I&E

Table 4: Strategic rationale sources for Microsoft Azure. The sources are Interpolation & Extrapolation (I&E) based on [62, 63, 64, 65, 66] if not stated otherwise.

Element	Type	Description	Source
Product be competitive	Goal	...	I&E
Improve product roadmapping	Task	...	[61]
Improve marketing strategy	Task	...	I&E
Product roadmapping be improved	Goal	...	[61]
Quality attributes be improved	Goal	...	[61]
Marketing strategy be improved	Goal	...	I&E
Improve core asset roadmapping	Task	Activities such as: Centralized registration management, Core asset identification, Make or buy decision, Core asset roadmap construction	[61]
Improve roadmap intelligence	Task	A combination of "Make product analysis" and "Make a partner roadmap" activities. Product analysis is an activity aimed to determine the weak and the strong aspects of the product, both technical and functional. Make a partner roadmap is an activity that creates a roadmap of what the partners would be developing in the future.	[61]
Improve functional attribute	Task	...	I&E
Improve quality attributes	Task	...	I&E
Performance aspects be improved	Task	...	[27]
Security aspects be improved	Task	...	[27]
Simplicity aspects be improved	Task	Improve simplicity of the system, both in how the system is built, how easy it is to set up the system and how easy it is for user to use the system.	[27]
Implement free trials policy	Task	A free trial gives customer a credit over the course of 30 days to try any combination of resources in Azure. If customer exceeds the credit amount, customer's account is suspended. At the end of the trial, customer's services are decommissioned and will no longer work. A customer can upgrade to a pay-as-customer-go subscription at any time	[59]
Implement Flexible pricing model	Task	Microsoft offers flexible pricing model for the Azure service.	[69]
Implement "Bring your own license" policy	Task	...	[70]
Competitive core asset roadmapping	Softgoal	...	[61]
Competitive roadmap intelligence	Softgoal	...	[61]
Competitive functional attributes	Softgoal	...	I&E
Competitive quality attributes	Softgoal	...	I&E
Competitive performance aspects	Softgoal	...	[27]
Competitive security aspects	Softgoal	...	[27]
Competitive simplicity aspects	Softgoal	...	[27]
Free trials policy be present	Softgoal	...	[59]
Flexible pricing model be present	Softgoal	...	[69]
"Bring your own license" policy is implemented	Softgoal	...	[70]
Competitive product roadmapping	Softgoal	...	[61]
Competitive marketing strategy	Softgoal	...	I&E
Product is competitive	Softgoal	...	I&E

Table 5: Strategic rationale sources for Microsoft SQL

Element	Type	Description	Source
Product be competitive	Goal	...	I&E
Improve roadmap intelligence	Task	...	[61]
Improve product roadmapping	Task	...	[61]
Improve core asset roadmapping	Task	Activities such as: Centralized registration management, Core asset identification, Make or buy decision, Core asset roadmap construction	[61]
Roadmap intelligence be improved	Goal	...	[61]
Analyze products	Task	A combination of "Make product analysis" and "Make a partner roadmap" activities. Product analysis is an activity aimed to determine the weak and the strong aspects of the product, both technical and functional. Make a partner roadmap is an activity that creates a roadmap of what the partners would be developing in the future.	[61]
Analyze trends	Task	A combination of "Analyze society trends", "Analyze technology trends" and "Analyze competition trends" activities. Society trends is an overview of the big picture of important trends in society in the coming years. Technology trends is an overview of the big picture of important developments in terms of technology in the coming years. Competition trends is an overview showing what competing product are doing in terms of their product development in the coming years.	[61]
Improve functional attributes	Task	...	[71]
Functional attributes be improved	Goal	...	[71]
Improve quality attributes	Task	...	[71]
Quality attributes be improved	Goal	...	[71]
Support ETL	Task	Extract-transform-load processes are supported that create copies of data and then load this data into a reporting platform. Whilst enabling enterprises to extract business value from their data, ETL processes have several common issues, e.g. they are expensive to develop, maintain and support; ETL processes are slow; ETL processes must be secured; ETL processes require storage.	[60]
Support data virtualization	Task	Data virtualization is an alternative to ETL. Data virtualization integrates data from disparate sources, locations and formats, without replicating or moving the data, to create a single "virtual" data layer that delivers unified data services to support multiple applications and users. This virtual data layer (also sometimes referred to as a data hub or data lake) allows users to query data from many sources through a consistent interface.	[60]
Improve security	Task
Improve performance	Task
Improve compatibility	Task	...	[60]
Implement machine learning	Task	...	[60]
Machine learning be improved	Goal	...	[60]
Security be improved	Goal	...	[60]
Performance be improved	Goal	...	[60]
Compatibility be improved	Goal	...	[60]
Implement machine learning on Linux	Task	SQL Server 2019 Machine learning Services (In-Database) is now supported on Linux	[60]
Implement input data partitioning	Task	Without changing your R or Python scripts, you can process data at table partition level. This allows you to train a model for each table partition and parallelize model training per partition.	[60]
Implement failover cluster support	Task	You can install SQL Server 2019 Machine Learning Services (In-Database) on a windows failover cluster to meet your requirements for redundancy and uptime in the even your primary server fails over.	[60]

Table 5: Continued

Element	Type	Description	Source
Implement Java language extension	Task	In addition to R and Python runtimes, SQL Server 2019 adds a Java language extension. This will allow you to call a pre-compiled Java program and securely execute Java code on SQL Server. This reduces the need to move data and improves application performance by bringing your workloads closer to your data. You specify the Java runtime you want to use, by installing the JDK distribution and Java version of your choice.	[60]
Support SQL data discovery and classification	Task	SQL data Discovery and Classification allows you to classify columns in your database that contain sensitive information. You can classify columns by the type of information they contain – names, addresses, social security numbers, and so on – and by the level of sensitivity of the data in the column – including levels such as public, general and confidential. You can easily generate reports from the classification you have applied to enable you to meet statutory and regulatory requirements, such as EU GDPR.	[60]
Support always encrypted with Secure Enclaves	Task	Always Encrypted is an encryption technology that protects the confidentiality of sensitive data from malware and high-privileged, but unauthorized users of SQL Server, including DBAs, machine admins and cloud admins. Sensitive data is never visible in plaintext to those users.	[60]
Support vulnerability assessment	Task	You can use vulnerability assessment to track compliance of your SQL Server instances and Azure SQL Database instances with recognized security best practices. The scanning process compares the configuration of your database with a list of security best-practices maintained by Microsoft; at the end of the scan, the tool generates a report of your security state and details of any security issues found, the severity of each issue, and remediation steps – no changes are made to your database. You can choose whether to implement the generated recommendation on your database.	[60]
Support Certificate management functionality in SQL Server configuration manager	Task	SSL/TLS certificates are widely used to secure access to SQL Server. With SQL Server 2019, certificate management is integrated into the SQL Server Configuration Manager UI, simplifying common tasks such as: Viewing and validating certificates installed in a SQL Server instance; Report on certificates close to expiration; Deploy certificates across machines participating in Always On Availability Groups; Deploy certificates across machines participating in a failover cluster instance.	[60]
Improve other security aspects	Task	Any other security aspects that are not covered by the tasks in the "Security be improved" goal decomposition	I&E
Support Persistent Memory devices	Task	Support for Persistent Memory (PMEM) devices is improved in this release. Any SQL server file that is placed on a PMEM device operates in enlightened mode. SQL Server directly accesses the device, bypassing the storage stack of the operating system.	[60]
Improve performance of columnstore indexes	Task	2019 version of SQL Server includes several features to improve the performance of columnstore indexes, such as automated columnstore index maintenance, better columnstore metadata memory management, a low-memory load path for columnstore tables, and improved performance for bulk loading to columnstore indexes.	[60]
Improve other performance aspects	Task	Performance aspects that do not fall under the category of other tasks that result after the decomposition "Performance be improved" goal in this model	I&E
Improve Linux compatibility	Task	2019 release of SQL Server is closer to feature parity with SQL Server on Windows. Features added to SQL Server on Linux include: Replication; Active Directory Integration; Distributed transaction.	[60]
Add more container options	Task	2019 release features new master container registry – the primary publishing location for SQL Server container images is a new container registry – the Microsoft Container Registry at the Microsoft website. Microsoft Container Registry is the official container registry for the distribution of Microsoft product containers. In addition, certified RHEL-based images are now published.	[60]
Add more language options	Task	...	[60]
Add more platform options	Task	...	[60]

Table 5: Continued

Element	Type	Description	Source
Enable high availability configuration for SQL Server running in containers	Task	SQL Server 2019 enables customers to configure highly-available systems with Always On Availability Groups using Kubernetes as an orchestration layer.	[60]
Implement support of up to five synchronous replica pairs	Task	SQL Server 2019 increases the limit for synchronous replica pairs from three to five. Users can now configure up to five synchronous replicas with automatic failover between these replicas.	[60]
Implement a better scale-out with automatic redirection of connection based on read/write intent	Task	Configuring an Always On Availability can be challenging for a number of reasons. To address these challenges, SQL Server 2019 adds a new feature for Availability Groups secondary to primary replica connection redirection. With this feature, client applications can connect to any of the replicas of the Availability Group and the connection will be redirected to the primary replica, according to the Availability Group configuration and the connection intent specified in the connection string.	[60]
Support high availability with remote storage on Kubernetes	Task	An option for high availability is to use a container orchestrator such as Kubernetes, and deploy SQL Server in a configuration that is like a shared disk failover cluster instance but use the container orchestrator capabilities instead of a failover cluster. This deployment model does not require specific enhancements, but SQL Server 2019 enables enhanced instance health check monitoring using the same operator pattern as Availability Group health check.	[60]
Other availability aspects be improved	Task	Other availability aspects that do not fall into the category of tasks resulting in the "Availability be improved" goal decomposition in this model	I&E
Improve simplicity	Task	The simplicity of the product is competitive compared to other products on the market.	[27]
Machine learning on Linux is implemented	Softgoal	SQL Server 2019 Machine Learning Services (In-Database) is now supported on Linux	[60]
Input data partitioning is implemented	Softgoal	Without changing your R or Python scripts, you can process data at table partition level. This allows you to train a model for each table partition and parallelize model training per partition.	[60]
Failover cluster support is implemented	Softgoal	You can install SQL Server 2019 Machine Learning Services (In-Database) on a windows failover cluster to meet your requirements for redundancy and uptime in the event your primary server fails over.	[60]
Java language extension is implemented	Softgoal	In addition to R and Python runtimes, SQL Server 2019 adds a Java language extension. This will allow you to call a pre-compiled Java program and securely execute Java code on SQL Server. This reduces the need to move data and improves application performance by bringing your workloads closer to your data. You specify the Java runtime you want to use, by installing the JDK distribution and Java version of your choice.	[60]
SQL data discovery and classification is supported	Softgoal	SQL data Discovery and Classification allows you to classify columns in your database that contain sensitive information. You can classify columns by the type of information they contain – names, addresses, social security numbers, and so on – and by the level of sensitivity of the data in the column – including levels such as public, general and confidential. You can easily generate reports from the classification you have applied to enable you to meet statutory and regulatory requirements, such as EU GDPR.	[60]
Always encrypted with Secure Enclaves is supported	Softgoal	Always Encrypted is an encryption technology that protects the confidentiality of sensitive data from malware and high-privileged, but unauthorized users of SQL Server, including DBAs, machine admins and cloud admins. Sensitive data is never visible in plaintext to those users.	[60]

Table 5: Continued

Element	Type	Description	Source
Vulnerability assessment is supported	Softgoal	You can use vulnerability assessment to track compliance of your SQL Server instances and Azure SQL Database instances with recognized security best practices. The scanning process compares the configuration of your database with a list of security best-practices maintained by Microsoft; at the end of the scan, the tool generates a report of your security state and details of any security issues found, the severity of each issue, and remediation steps – no changes are made to your database. You can choose whether to implement the generated recommendation on your database.	[60]
Competitive other security aspects	Softgoal	Any other security aspects that are not covered by the softgoals in the "Competitive security" softgoal decomposition	I&E
Certificate management functionality in SQL Server configuration manager is supported	Softgoal	SSL/TLS certificates are widely used to secure access to SQL Server. With SQL Server 2019, certificate management is integrated into the SQL Server Configuration Manager UI, simplifying common tasks such as: Viewing and validating certificates installed in a SQL Server instance; Report on certificates close to expiration; Deploy certificates across machines participating in Always On Availability Groups; Deploy certificates across machines participating in a failover cluster instance.	[60]
Persistent Memory devices are supported	Softgoal	Support for Persistent Memory (PMEM) devices is improved in this release. Any SQL server file that is placed on a PMEM device operates in enlightened mode. SQL Server directly accesses the device, bypassing the storage stack of the operating system.	[60]
High performance of columnstore indexes	Softgoal	2019 version of SQL Server includes several features to improve the performance of columnstore indexes, such as automated columnstore index maintenance, better columnstore metadata memory management, a low-memory load path for columnstore tables, and improved performance for bulk loading to columnstore indexes.	[60]
Competitive other performance aspects	Softgoal	Performance aspects that do not fall under the category of other softgoals that result after the decomposition of "Competitive performance" softgoal in this model	I&E
Compatible with Linux	Softgoal	2019 release of SQL Server is closer to feature parity with SQL Server on Windows. Features added to SQL Server on Linux include: Replication; Active Directory Integration; Distributed transaction.	[60]
A lot of container options	Softgoal	2019 release features new master container registry – the primary publishing location for SQL Server container images is a new container registry – the Microsoft Container Registry at the Microsoft website. Microsoft Container Registry is the official container registry for the distribution of Microsoft product containers. In addition, certified RHEL-based images are now published.	[60]
A lot of language options	Softgoal	...	[60]
A lot of platform options	Softgoal	...	[60]
High availability configuration for SQL Server running in containers	Softgoal	SQL Server 2019 enables customers to configure highly-available systems with Always On Availability Groups using Kubernetes as an orchestration layer.	[60]
Support of a large number of synchronous replica pairs	Softgoal	SQL Server 2019 increases the limit for synchronous replica pairs from three to five. Users can now configure up to five synchronous replicas with automatic failover between these replicas.	[60]
Efficient scale-out with automatic redirection of connection based on read/write intent	Softgoal	Configuring an Always On Availability can be challenging for a number of reasons. To address these challenges, SQL Server 2019 adds a new feature for Availability Groups secondary to primary replica connection redirection. With this feature, client applications can connect to any of the replicas of the Availability Group and the connection will be redirected to the primary replica, according to the Availability Group configuration and the connection intent specified in the connection string.	[60]
High availability with remote storage on Kubernetes	Softgoal	An option for high availability is to use a container orchestrator such as Kubernetes, and deploy SQL Server in a configuration that i like a shared disk failover cluster instance but use the container orchestrator capabilities instead of a failover cluster. This deployment model does not require specific enhancements, but SQL Server 2019 enables enhanced instance health check monitoring using the same operator pattern as Availability Group health check.	[60]

Table 5: Continued

Element	Type	Description	Source
Competitive other availability aspects	Softgoal	Other availability aspects that do not fall into the category of softgoals resulting in the "Competitive availability" softgoal decomposition in this model	I&E
Competitive simplicity	Softgoal	The simplicity of the product is competitive compared to other products on the market.	[27]
Analyzed products	Softgoal	A result of combination of "Make product analysis" and "Make a partner roadmap" activities. Product analysis is an activity aimed to determine the weak and the strong aspects of the product, both technical and functional. Make a partner roadmap is an activity that creates a roadmap of what the partners would be developing in the future.	[61]
Analyzed trends	Softgoal	A result of combination of "Analyze society trends", "Analyze technology trends" and "Analyze competition trends" activities. Society trends is an overview of the big picture of important trends in society in the coming years. Technology trends is an overview of the big picture of important developments in terms of technology in the coming years. Competition trends is an overview showing what competing product are doing in terms of their product development in the coming years.	[61]
Machine Learning is supported	Softgoal	...	[60]
ETL is supported	Softgoal	Extract-transform-load processes are supported that create copies of data and then load this data into a reporting platform. Whilst enabling enterprises to extract business value from their data, ETL processes have several common issues, e.g. they are expensive to develop, maintain and support; ETL processes are slow; ETL processes must be secured; ETL processes require storage.	[60]
Data virtualization is supported	Softgoal	Data virtualization is an alternative to ETL. Data virtualization integrates data from disparate sources, locations and formats, without replicating or moving the data, to create a single "virtual" data layer that delivers unified data services to support multiple applications and users. This virtual data layer (also sometimes referred to as a data hub or data lake) allows users to query data from many sources through a consistent interface.	[60]
Competitive security	Softgoal	...	
Competitive performance	Softgoal	...	
Competitive compatibility	Softgoal	...	[60]
Competitive availability	Softgoal	...	[60]
Competitive functional attributes	Softgoal	...	[71]
Competitive quality attributes	Softgoal	...	[71]
Good roadmap intelligence	Softgoal	...	[61]
Good software product roadmap	Softgoal	...	[61]
Good core asset roadmapping	Softgoal	Results of activities such as: Centralized registration management, Core asset identification, Make or buy decision, Core asset roadmap construction	[61]
Competitive product	Softgoal	...	I&E

Table 6: Strategic rationale sources for SME

Element	Type	Description	Source
Create strategic advantage on the market	Goal	...	[72]
Use database service that fits best	Task	...	I&E
Best fitting database service be used	Goal	...	I&E
Save costs	Task	...	[57]
Make easy to use	Task	...	[57]
Make reliable	Task	...	[57]
Make secure	Task	...	[57]
Improve sharing and collaboration	Task	...	[57]
Cost saving	Softgoal	...	[57]
Easy to use	Softgoal	...	[57]
Reliable	Softgoal	...	[57]
Secure	Softgoal	...	[57]
Improved sharing and collaboration	Softgoal	...	[57]
Database needs are covered	Softgoal	...	I&E
Has strategic advantage	Softgoal	...	[72]

Table 7: Strategic rationale sources for LE

Element	Type	Description	Source
Have strategic advantage on the market	Goal	...	[73]
Create strategic advantage on the market	Task	...	[73]
IT infrastructure be competitive	Goal	...	I&E
Manage data	Task	...	I&E
Good data management	Softgoal	...	I&E
Competitive IT infrastructure	Softgoal	...	I&E
Strategic advantage on the market	Softgoal	...	[73]

Table 8: Strategic rationale sources for LE IT department

Element	Type	Description	Source
Create strategic advantage on the market	Task	...	I&E
Use best DB service	Task	...	I&E
Best DB service be provided	Goal	...	I&E
Make DB service resilient	Task	...	I&E
DB service be resilient	Goal	...	I&E
Make DB service more accessible	Task	...	I&E
DB service be more accessible	Goal	...	I&E
Make DB service meet business needs	Task	...	I&E
DB service meets business needs	Goal	...	I&E
Improve scalability	Task	...	[56]
Improve security	Task	...	[56]
Improve data governance	Task	Data governance includes data availability, usability and integrity [74]	[56]
Improve data mitigation	Task	Data mitigation is considered to be synonymous to "data security" in the context of this research [74]	[56]
Improve third party engagement	Task	...	[56]
Improve interoperability	Task	...	[56]
Improve business process management	Task	...	[56]
Make skills more transferable	Task	...	[56]
Improved security	Softgoal	...	[56]
Improved data governance	Softgoal	...	[56]
Improved data mitigation	Softgoal	...	[56]
Improved third party engagement	Softgoal	...	[56]
Improved interoperability	Softgoal	...	[56]
Improved business process management	Softgoal	...	[56]
Skills are more transferable	Softgoal	...	[56]
Resilience	Softgoal	...	I&E
Accessibility	Softgoal	...	I&E
Meets business needs	Softgoal	...	I&E
Improved scalability	Softgoal	...	[56]
Database needs are covered	Softgoal	...	[56]
Has strategic advantage	Softgoal	...	I&E

B Coincidental Links

Table 9: Coincidental contribution links for the strategic rationale model. Contributor of the link is the element from which the link originates, the recipient is the element to which the link points to.

Actor	Contributor	Recipient	Type	Explanation
LE IT Department	Improve security	Improved data mitigation	Help	Improving security can reduce the risk of data leaks.
LE IT Department	Improve security	Improved third party engagement	Hurt	Improving security can make the engagement with third party more difficult because the third party would need to meet the security standards first.
LE IT Department	Improve security	Improved interoperability	Hurt	Improved security may require software solutions that may possibly differ from one system to another.
LE IT Department	Improve security	Improved scalability	Hurt	Improved security can mean additional resources would need to be allocated in order to scale the system.
LE IT Department	Improve data governance	Improved third party engagement	Help	Improved data governance means that the data is well organized and easily accessible. This makes it easier for the third party to access and use the data.
LE IT Department	Improve data governance	Improved interoperability	Help	Storing data in a standardized way can help using that data on different systems.
LE IT Department	Improve data governance	Improved scalability	Help	Well governed data can mean that less resources need to be allocated in order to effectively use the data, should the system be scaled.
LE IT Department	Improve data mitigation	Improved security	Help	Improving data mitigation means lowering overall security risks.
LE IT Department	Improve third party engagement	Improved data mitigation	Hurt	Third party engagement brings the risks of leaking the shared data.
LE IT Department	Improve third party engagement	Improved business process management	Help	Improving third party engagement can lead to easier integration of the third party into the business processes of the company.
LE IT Department	Improve interoperability	Improved third party engagement	Help	Improved interoperability means that the DB service can be run on different systems, which can be used by other companies.
LE IT Department	Improve interoperability	Improved scalability	Hurt	Improved interoperability can lead to the system being less scalable due to the interoperability-oriented software design decisions.
LE IT Department	Improve business process management	Improved third party engagement	Help	Better defined business processes can help engage better with a third party, for example thanks to well defined responsibilities of both parties in the business process.
LE IT Department	Improve scalability	Improved security	Hurt	Scalability oriented design of the software may hinder the security of the software.
LE IT Department	Improve scalability	Improved interoperability	Hurt	Scalability oriented design can lower the interoperability of the service.
SME	Save costs	Easy to use	Hurt	Saving costs can mean decreasing the budget for the easiness of use of the service, e.g. a cheaper service that is not very user friendly can be chosen.
SME	Save costs	Reliable	Hurt	Saving costs can mean choosing a cheaper database service that can be not as reliable as more expensive alternatives.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation	
SME	Save costs	Secure	Hurt	Saving costs can mean that a less secure database service can be chosen, compared to the alternatives on the market. Furthermore, not all best security practices can be implemented with a small budget.	
SME	Save costs	Improve sharing and collaboration	Hurt	Saving costs can mean choosing a cheaper DB service that does not provide as good sharing and collaboration options as the alternatives on the market do.	
SME	Make easy to use	Cost saving	Hurt	A service with a good ease of use characteristic can be more expensive compared to the alternatives on the market.	
SME	Make easy to use	Improved sharing and collaboration	Help	Making a service easy to use can improve sharing and collaboration due to the user friendliness of the service.	
SME	Make reliable	Cost saving	Hurt	A service with higher reliability can cost more than the alternatives on the market with lower reliability.	
SME	Make secure	Cost saving	Hurt	A service scoring high on the security can cost more than other, more basic, alternatives on the market. Furthermore, some security best practices may require additional resources for their implementation.	
SME	Make secure	Easy to use	Hurt	Some security best practices may involve specific user behavior, such as a use of more complex identification and authentication procedures.	
SME	Make secure	Improved sharing and collaboration	Hurt	Some security practices can make sharing and collaboration more complex due to a specific security best practices, such as the use of specific authorization practices for data access.	
SME	Improve sharing and collaboration	Cost saving	Hurt	Implementing improved sharing and collaboration best practices and other specific requirements can require additional spending of the resources.	
SME	Improve sharing and collaboration	Secure	Hurt	Improved sharing and collaboration can make the whole system less secure due to more actors having access to the data. Furthermore, complex sharing and collaboration requirements can require additional security measures to mitigate new potential risks.	
Amazon	Identify trends	market	Analysis of customer win/loss	Help	Identified market trends can help calculating the expected win/loss of the customer more accurately.
Amazon	Identify trends	market	Analysis of competitors	Help	Identified market trends can help analyzing and understanding competitors better due to placing the competitors in the context of the market.
Amazon	Identify trends	market	Product life cycle	Help	Identifying market trends can help managing portfolio innovation decision due to placing the innovation initiatives in the context of the future market situation.
Amazon	Identify trends	market	Own product be well developed	Help	Knowing market trends can help developing own products by providing more context to what problems need to be solved by the software product in order to seize the market opportunities.
Amazon	Identify trends	market	A lot of available resources	Hurt	Identify market trends task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon	Make a market strategy	Product life cycle	Help	A defined market strategy can help product life cycle by putting the product in the context of the company's strategy.
Amazon	Make a market strategy	Portfolio innovation decision	Help	A defined market strategy can help portfolio innovation decision by placing such decisions in the context of the current market strategy.
Amazon	Make a market strategy	Own product be well developed	Help	With a market strategy a more accurate plan for own software product development can be made. Such plan would be based on the parts of the market strategy that state, what markets segments need to be conquered and what are the prerequisites for that.
Amazon	Make a market strategy	Profitable	Help	Typically, a market strategy of the company solves, among other problems, the problem of generating income in the current market.
Amazon	Make a market strategy	R&D yield	Help	A defined market strategy can make one sided short term collaboration more effective due to the better understanding of the market situation. This can potentially increase the R&D yield of the company.
Amazon	Make a market strategy	Acquisition capabilities	Help	A defined market strategy can improve acquisition capabilities of the company due to a better understanding of the situation of the market and how to act in such situation, e.g. what is the company's current budget for R&D acquisitions.
Amazon	Make a market strategy	Partner's product generates revenue	Help	A defined market strategy usually includes the strategy for handling the assets of the company, in this case the strategy for managing the partner's product that is being resold.
Amazon	Make a market strategy	Effective DBaaS management	Help	A market strategy usually includes the manner in which own products, that are complimentary to the partner's products, are sold.
Amazon	Make a market strategy	Effective IAAS management	Help	A market strategy usually includes the manner in which own products, that are complimentary to the partner's products, are sold.
Amazon	Make a market strategy	Directly competitive product generates revenue	Help	A marketing strategy usually describes how the products of the company should be sold in the context of another product, that is directly competitive, on the market.
Amazon	Make a market strategy	A lot of available resources	Hurt	Make a market strategy task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Analyze customer win/loss	Up to date market strategy	Help	Analyzing customer win/loss can help making marketing strategy more accurate and up to date due to a better understanding of a (typical) customer
Amazon	Analyze customer win/loss	Product life cycle	Help	Product life cycle can benefit from knowing how customers use the product, what are the win/loss.
Amazon	Analyze customer win/loss	Portfolio innovation decision	Help	Portfolio innovation decision can benefit from knowing what the current customer win/loss is, as well as the reasons for it. Those reasons can be stated as a problem that needs to be solved in the future.
Amazon	Analyze customer win/loss	Business case analysis	Help	Business case analysis can benefit from more in depth knowledge of current customer win/loss.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon	Analyze win/loss	customer Own product be well developed	Help	Customer win/loss analysis can provide a very valuable context to what are the most important functional and quality requirements that the customer needs. With this knowledge, more accurate and complete requirements, as well as more efficient planning for own product development can be done.
Amazon	Analyze win/loss	customer Service level agreements	Help	Service level agreements can benefit from knowing what customer win/loss are. Depending on how critical customer win are, the appropriate level of support can be offered.
Amazon	Analyze win/loss	customer Established and evaluated pricing model	Help	Established and evaluated pricing model would be more accurate if customer win/loss is known.
Amazon	Analyze win/loss	customer Complimentary product generates revenue	Help	Knowing customer win/loss allows to narrow down what needs to be addressed in order to improve customer win and decrease loss.
Amazon	Analyze win/loss	customer A lot of available resources	Hurt	Analyze customer win/loss task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Analyze competitors	Up to date market strategy	Help	Knowing competitors can help shape market strategy better, e.g. make more informed decisions regarding cooperation or competition on a given segment of the market.
Amazon	Analyze competitors	Portfolio innovation decision	Help	Portfolio innovation decision can be made more informed if there is knowledge of the competitors and their products.
Amazon	Analyze competitors	Own product be well developed	Help	By knowing the strengths and weaknesses of the competitors, own product can be developed taking that into account, so that it would have more lucrative unique selling points.
Amazon	Analyze competitors	Acquisition capabilities	Help	Knowing a lot about competitors can help acquiring companies by knowing what weaknesses the company has and what companies on the market can be purchased to bridge that gap.
Amazon	Analyze competitors	Established and evaluated pricing model	Help	Having an analysis of the competitors can help better understand rationale behind their pricing model. Furthermore, knowing the pricing model of the competitors can serve as a reference point for the price model of the company.
Amazon	Analyze competitors	Effective DBaaS management	Help	Knowing the competitors of the company can help understanding where the reselling product stands in comparison with the competitor's product.
Amazon	Analyze competitors	Effective IAAS management	Help	Knowing the competitors of the company can help understanding where the reselling product stands in comparison with the competitor's product.
Amazon	Analyze competitors	Directly competitive product generates revenue	Help	Knowing the product of the competitor can help positioning the product of the company on the market better.
Amazon	Analyze competitors	Complimentary product generates revenue	Help	Better understanding of the competitor can help better understand what needs to be improved in the company's product in order for it to be competitive on the market.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon	Analyze competitors	A lot of available resources	Hurt	Analyze competitors task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Analyze product life cycle	Portfolio innovation decision	Help	Analyze product life cycle task can help portfolio innovation decision be providing the context, e.g. if the product is approaching the end of it's life cycle a decision to focus more on the technological innovations for the next generation of the product.
Amazon	Analyze product life cycle	Own product be well developed	Help	By knowing where the product is in it's life cycle, more rational decisions can be made regarding the product development, e.g. young products can receive more focus for new functional properties development, whereas with older products the focus can be shifted to the maintenance, bug patching and overall stability improvements.
Amazon	Analyze product life cycle	Service level agreements	Help	Analyzing product life cycle can help service level agreements, e.g. by providing much more support to the products in the beginning of their life cycle and much lower level of support to the products in the end of their life cycle.
Amazon	Analyze product life cycle	Acquisition capabilities	Help	Analyzing product life cycle can help acquisition capabilities, e.g. if the product is in the end of it's life cycle, a decision to acquire a product for the next generation of the company's product, instead of developing the next generation, can be made.
Amazon	Analyze product life cycle	Established and evaluated pricing model	Help	Analyzing product life cycle can help established and evaluated pricing model, e.g. a price of the product can be dependent on the life cycle stage of the product, a newer product can be more expensive, than an old one.
Amazon	Analyze product life cycle	Effective DBaaS management	Help	Analyzing product life cycle can help effective DBaaS management, since DBaaS management acts as an addition to the product, so certain management decisions regarding DBaaS can be made, e.g. "To what extent should DBaaS be improved?", "How long should DBaaS be actively developed for?".
Amazon	Analyze product life cycle	Effective IAAS management	Help	Analyzing product life cycle can help effective IAAS management, since IAAS management acts as an addition to the product, so certain management decisions regarding IAAS can be made, e.g. "To what extent should IAAS be improved?", "How long should IAAS be actively developed for?".
Amazon	Analyze product life cycle	Complimentary product generates revenue	Help	Analyzing product life cycle can help complimentary product generates revenue softgoal, e.g. more young products may receive more improvement efforts.
Amazon	Analyze product life cycle	A lot of available resources	Hurt	Analyze product life cycle task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Decide on portfolio innovation	Product life cycle	Help	Decisions on portfolio innovations can influence product life cycle, e.g. if certain innovations are to be introduced in the current generation of the product or in the next one.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon	Decide on portfolio innovation	Portfolio scope analysis	Help	Decisions on portfolio innovation can influence portfolio scope analysis, e.g. should a gap in the market, defined by the market strategy, yet not covered by any products yet, be covered by expanding the functionality of one of the existing product or by developing an entirely new product.
Amazon	Decide on portfolio innovation	Own product be well developed	Help	By deciding which trends to incorporate into the product, more accurate planning and more full requirements description can be done regarding own product.
Amazon	Decide on portfolio innovation	Acquisition capabilities	Help	Decisions on portfolio innovation can influence acquisition capabilities, because instead of developing an innovative feature, core asset or a product, in some cases it can be purchased.
Amazon	Decide on portfolio innovation	A lot of available resources	Hurt	Decide on portfolio innovation task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Analyze portfolio scope	Analysis of customer win/loss	Help	Analyze portfolio scope task can help analysis of customer win/loss softgoal by providing information regarding what gaps exist in the company portfolio, then analyzing why the customer did or did not choose company's products.
Amazon	Analyze portfolio scope	Analysis of competitors	Help	Analyze portfolio scope task helps analysis of competitors softgoal by giving more information for comparison of competitor's products to the products of the company, as well as existing gaps in the functionality of company's portfolio of products and the functionality gaps in the competitor's product portfolio.
Amazon	Analyze portfolio scope	Portfolio innovation decision	Help	Analyze portfolio scope can help portfolio innovation decision by stating the existing gaps in the company's portfolio. Such gaps can support the innovations aimed to bridge the gaps.
Amazon	Analyze portfolio scope	Own product be well developed	Help	Analyze portfolio scope can help developing own product by giving more information about existing functionality gaps. If the decision to bridge such gaps is made, more accurate requirement description can be made for own product development.
Amazon	Analyze portfolio scope	A lot of available resources	Hurt	Analyze portfolio scope task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Analyze business case	Analysis of customer win/loss	Help	Analyze business case task can help analysis of customer win/loss softgoal by providing information how well the product performs given the business case. With such context more conclusions can be drawn from customer win/loss analysis regarding why the customer chose to or not to purchase the product.
Amazon	Analyze business case	Analysis of competitors	Help	Analyze business case task can help analysis of competitors by providing more context about how company's product performs given the business case. After that, this performance can be compared to the performance of the competitor's product.

Table 9: Continued

Actor	Contributor		Recipient	Type	Explanation
Amazon	Analyze case	business	Product life cycle	Help	Analyze business case task can help product life cycle softgoal by giving more information about the business case the product is working with, so that during the product life cycle assessment the functionality of the product is evaluated against more accurate and updated business case.
Amazon	Analyze case	business	Portfolio innovation decision	Help	Analyze business case task can help portfolio innovation decision softgoal by providing a more updated and accurate business case, so that more informed decisions regarding incorporating market trends to tackle such business case can be made.
Amazon	Analyze case	business	Portfolio scope analysis	Help	Analyze business case can help portfolio scope analysis by providing more up to date and detailed business case that can help identifying and estimating the current functionality gaps in the company product portfolio.
Amazon	Analyze case	business	Own product be well developed	Help	Analyze business case can help own product development by providing more information about business cases. This way, during own product development, planning for the development of assets can be done by analyzing what functionality is missing from the software product.
Amazon	Analyze case	business	Service level agreements	Help	Analyze business case can help service level agreements softgoal by providing more context to what aspects of the business case are of most importance to the customer and then adjusting the service level agreement to meet the demands of the business case.
Amazon	Analyze case	business	A lot of available resources	Hurt	Analyze business case task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Product development	development	Product life cycle	Help	Product development task can help product life cycle by sharing knowledge about technical aspects of the product, e.g. assets that are planned for development.
Amazon	Product development	development	Portfolio innovation decision	Help	Product development can help portfolio innovation decision, e.g. by sharing knowledge about how much resources are utilized right now for the development of the planned future assets.
Amazon	Product development	development	Intellectual property management	Help	Product development can help intellectual property management by using development practices that can protect intellectual properties, e.g. good licensing practices, security measures for storing source code.
Amazon	Product development	development	Established and evaluated pricing model	Help	Product development can help to evaluate the pricing model by providing information about how much resources were spent on the product.
Amazon	Product development	development	Effective DBaaS management	Help	Product development improves the functional and non-functional qualities of the DBaaS product.
Amazon	Product development	development	Effective IAAS management	Help	Product development improves the functional and non-functional qualities of the IAAS product.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon	Product development	Directly competitive product generates revenue	Help	Product development can help directly competitive product generates revenue by further developing the directly competitive product, which usually leads to better product sales, since usually the more functional and the better non-functional attributes of the product are, the better the product sells.
Amazon	Product development	Complimentary product generates revenue	Help	Product development can focus on complimentary product generates revenue softgoal by improving the functional and non-functional attributes that are most likely to improve the revenue generated by the product.
Amazon	Product development	A lot of available resources	Hurt	Product development task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Long term collaboration	Up to date market trends	Help	Long term collaboration can help keeping market trends up to date by having more information about what other actors on the market are working on and what other actors on the market are interested in.
Amazon	Long term collaboration	Product life cycle	Help	Long term collaboration task can help product life cycle by sharing knowledge about technical aspects of the product, e.g. assets that are planned for development.
Amazon	Long term collaboration	Portfolio innovation decision	Help	Long term collaboration can help portfolio innovation decision, e.g. by sharing knowledge about how much resources are utilized right now for the development of the planned future assets.
Amazon	Long term collaboration	Trustworthy	Help	Long term collaboration can increase the trust to the company, e.g. by showing other potential partners that the company can maintain and not break long term agreements.
Amazon	Long term collaboration	Intellectual property management	Help	Long term collaboration can help intellectual property management by using development practices that can protect intellectual properties, e.g. good licensing practices, security measures for storing source code, defining clearly how the code created in collaboration can be used by all parties.
Amazon	Long term collaboration	Established and evaluated pricing model	Help	Long term collaboration can help to evaluate the pricing model by providing information about how much resources were spent on the product.
Amazon	Long term collaboration	Effective DBaaS management	Help	Long term collaboration improves the functional and non-functional qualities of the DBaaS product.
Amazon	Long term collaboration	Effective IAAS management	Help	Long term collaboration improves the functional and non-functional qualities of the IAAS product.
Amazon	Long term collaboration	Complimentary product generates revenue	Help	Long term collaboration can focus on complimentary product generates revenue by working on functional and non functional attributes that are most likely to improve the revenue from the product.
Amazon	Long term collaboration	A lot of available resources	Hurt	Long term collaboration task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon	One sided short term collaboration	Portfolio innovation decision	Help	One sided short term collaboration can help portfolio innovation decision, e.g. by sharing knowledge about what the partner is working on and how successful the clone of partner's innovation can be.
Amazon	One sided short term collaboration	Trustworthy	Hurt	One sided short term collaboration can hurt the trustworthiness of the company by indicating to other actors on the market that the company finds it acceptable to break long term agreements for the sake of short term profit.
Amazon	One sided short term collaboration	Intellectual property management	Help	One sided short term collaboration can help intellectual property management by using development practices that can protect intellectual properties, e.g. good licensing practices, security measures for storing source code, defining clearly how the code created in collaboration can be used by all parties.
Amazon	One sided short term collaboration	Established and evaluated pricing model	Help	One sided short term collaboration can help to evaluate the pricing model by providing information about how much resources were spent on the product.
Amazon	One sided short term collaboration	Effective DBaaS management	Help	One sided short term collaboration can improve the functional and non-functional qualities of the DBaaS product.
Amazon	One sided short term collaboration	Effective IAAS management	Help	One sided short term collaboration can improve the functional and non-functional qualities of the IAAS product.
Amazon	One sided short term collaboration	Directly competitive product generates revenue	Help	One sided short term collaboration can improve directly competitive product generates revenue by cloning the functional and non functional attributes of the competitive product.
Amazon	One sided short term collaboration	A lot of available resources	Hurt	One sided short term collaboration task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Make acquisition	Established and evaluated pricing model	Help	Making an acquisition can improve established and evaluated pricing model by providing information about how much it cost to purchase the product and how the product needs to be sold to become profitable.
Amazon	Make acquisition	Effective DBaaS management	Help	Make acquisition can help effective DBaaS management by providing assets that can improve DBaaS.
Amazon	Make acquisition	Effective IAAS management	Help	Make acquisition can help effective IAAS management by providing assets that can improve IAAS.
Amazon	Make acquisition	Directly competitive product generates revenue	Help	Make acquisition can help directly competitive product generates revenue by purchasing assets that can help make company's directly competitive product better.
Amazon	Make acquisition	Complimentary product generates revenue	Help	Make acquisition can help complimentary product generates revenue by purchasing assets that can add to functional and non functional attributes of the product.
Amazon	Make acquisition	A lot of available resources	Hurt	Make acquisition task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon	Develop service level agreements	Analysis of customer win/loss	Help	Develop service level agreements can help analysis of customer win/loss softgoal by providing information about what kind of support will be provided to the customer and how this support will benefit the customer.
Amazon	Develop service level agreements	Business case analysis	Help	Develop service level agreements can help business case analysis by providing information about how service level agreement can benefit to the business case.
Amazon	Develop service level agreements	Established and evaluated pricing model	Help	Develop service level agreements can help established and evaluated pricing model softgoal by providing information regarding how much it costs to provide service to the customer.
Amazon	Develop service level agreements	Effective DBaaS management	Help	Develop service level agreements can help effective DBaaS management by providing additional support to the DBaaS.
Amazon	Develop service level agreements	Effective IAAS management	Help	Develop service level agreements can help effective IAAS management by providing additional support to the IAAS.
Amazon	Develop service level agreements	Directly competitive product generates revenue	Help	Develop service level agreements can help directly competitive product generates revenue by providing additional paid support to the product after it has been purchased by the customer.
Amazon	Develop service level agreements	A lot of available resources	Hurt	Develop service level agreements task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Manage intellectual property	Own product be well developed	Help	Manage intellectual property can help own product be well developed by specifying the development and licensing practices, so that the source code is protected from the third parties and can not be used by other parties without the consent of the company.
Amazon	Manage intellectual property	Shared R&D assets	Help	Manage intellectual property can help shared R&D assets by specifying how the assets developed by the company and it's partners can be used by each party.
Amazon	Manage intellectual property	Acquired R&D assets	Help	Manage intellectual property can help acquired R&D assets by specifying how the newly acquired assets can be used by other parties, as well as ensuring that newly acquired assets' source code is stored in a safe manner.
Amazon	Manage intellectual property	Effective DBaaS management	Help	Manage intellectual property can help Effective DBaaS management by ensuring all assets of the DBaaS are stored safely, have a proper license.
Amazon	Manage intellectual property	Effective IAAS management	Help	Manage intellectual property can help Effective IAAS management by ensuring all assets of the IAAS are stored safely, have a proper license.
Amazon	Manage intellectual property	Directly competitive product generates revenue	Help	Manage intellectual property can help directly competitive product generates revenue softgoal by making sure all assets are stored safely, all licenses of those assets are in order.
Amazon	Manage intellectual property	A lot of available resources	Hurt	Manage intellectual property task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon	Investigate distribution channels	Up to date market trends	Help	Investigate distribution channels can help up to date market trends softgoal by providing knowledge about what distribution channels are currently the most effective, as well as knowledge about emerging distribution channels.
Amazon	Investigate distribution channels	Up to date market strategy	Help	Investigate distribution channels can help up to date market strategy softgoal by giving knowledge about how certain distribution channels can help entering new market niches and/or solidifying company's position on a certain market niche.
Amazon	Investigate distribution channels	Analysis of competitors	Help	Investigate distribution channels can help analysis of competitors softgoal by specifying how effective a given distribution channel is.
Amazon	Investigate distribution channels	Own product be well developed	Help	Investigate distribution channels can help own product be well developed by specifying how the product needs to be distributed.
Amazon	Investigate distribution channels	Intellectual property management	Help	Investigate distribution channels can help intellectual property management, e.g. by specifying what threat of piracy each distribution channel poses.
Amazon	Investigate distribution channels	Partner's product generates revenue	Help	Investigate distribution channels can help partner's product generates revenue softgoal by choosing the distribution channel that generates most sales.
Amazon	Investigate distribution channels	Effective DBaaS management	Help	Investigate distribution channels can help effective DBaaS management by e.g. specifying what distribution channel will generate most revenue from the sales of DBaaS.
Amazon	Investigate distribution channels	Effective IAAS management	Help	Investigate distribution channels can help effective IAAS management by e.g. specifying what distribution channel will generate most revenue from the sales of IAAS.
Amazon	Investigate distribution channels	Directly competitive product generates revenue	Help	Investigate distribution channels can help directly competitive product generates revenue softgoal by e.g. specifying what distribution channel is most likely to generate most revenue from the sale of directly competitive product.
Amazon	Investigate distribution channels	A lot of available resources	Hurt	Investigate distribution channels task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Establish and evaluate pricing model	Up to date market strategy	Help	Establish and evaluate pricing model can help up to date market strategy softgoal by e.g. providing a current selling price of the product so that during the market strategy evaluation a decision can be made if the product is still viable.
Amazon	Establish and evaluate pricing model	Analysis of customer win/loss	Help	Establish and evaluate pricing model can help analysis of customer win/loss, since the cost of the product is one of the factors the customer takes into account when choosing a product.
Amazon	Establish and evaluate pricing model	Analysis of competitors	Help	Establish and evaluate pricing model can help analysis of competitors softgoal e.g. by comparing the price of the company's product to the price of the product the company is competing with.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon	Establish and evaluate pricing model	Profitable	Help	Establish and evaluate pricing model can help profitable softgoal, since one of the goals of the pricing model is to maximize the revenue from the product.
Amazon	Establish and evaluate pricing model	Distribution channels investigation	Help	Establish and evaluate pricing model can help distribution channels investigation softgoal by specifying what pricing models can be used for certain distribution channels.
Amazon	Establish and evaluate pricing model	Partner's product generates revenue	Help	Establish and evaluate pricing model can help partner's product generates revenue softgoal by specifying a price of the product so that it generates most revenue.
Amazon	Establish and evaluate pricing model	Effective DBaaS management	Help	Establish and evaluate pricing model can help effective DBaaS management softgoal by specifying an optimal price for the unit of DBaaS so that it generates most revenue.
Amazon	Establish and evaluate pricing model	Effective IAAS management	Help	Establish and evaluate pricing model can help effective IAAS management softgoal by specifying an optimal price for the unit of IAAS so that it generates most revenue.
Amazon	Establish and evaluate pricing model	Directly competitive product generates revenue	Help	Establish and evaluate pricing model can help directly competitive product generates revenue softgoal by providing a specific price that would maximize the revenue of the product.
Amazon	Establish and evaluate pricing model	Complimentary product generates revenue	Help	Establish and evaluate pricing model can help complimentary product generates revenue by specifying what pricing model would maximize the revenue from the sales of the product.
Amazon	Establish and evaluate pricing model	A lot of available resources	Hurt	Establish and evaluate pricing model task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Sell product as is	Up to date market strategy	Help	Sell product as is can help up to date market strategy by providing sales information that can allow better understanding of current situation on the market.
Amazon	Sell product as is	Product life cycle	Help	Sell product as is can help product life cycle softgoal by providing information about product sales, that can be then used to determine the stage of life of the product more precisely.
Amazon	Sell product as is	Profitable	Help	Sell product as is can help profitable softgoal by generating revenue from the product sales.
Amazon	Sell product as is	Service level agreements	Help	Sell product as is can help service level agreements, since service level agreements are usually only made after the product has been purchased by the customer.
Amazon	Sell product as is	Distribution channels investigation	Help	Sell product as is can help distribution channels investigation softgoal by providing information about sales thorough various distribution channels.
Amazon	Sell product as is	Established and evaluated pricing model	Help	Sell product as is can help established and evaluated pricing model by providing a real life information about the effectiveness of the current pricing model.
Amazon	Sell product as is	A lot of available resources	Hurt	Sell product as is task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon	Offer DBaaS	Up to date market strategy	Help	Offer DBaaS can help up to date market strategy by providing sales information that can allow better understanding of current situation on the market.
Amazon	Offer DBaaS	Product life cycle	Help	Offer DBaaS can help product life cycle softgoal by providing information about product sales, that can be then used to determine the stage of life of the product more precisely.
Amazon	Offer DBaaS	Profitable	Help	Offer DBaaS can help profitable softgoal by generating revenue from the product sales.
Amazon	Offer DBaaS	Service level agreements	Help	Offer DBaaS can help service level agreements, since service level agreements are usually only made after the product has been purchased by the customer.
Amazon	Offer DBaaS	Distribution channels investigation	Help	Offer DBaaS can help distribution channels investigation softgoal by providing information about sales thorough various distribution channels.
Amazon	Offer DBaaS	Established and evaluated pricing model	Help	Offer DBaaS can help established and evaluated pricing model by providing a real life information about the effectiveness of the currents pricing model.
Amazon	Offer DBaaS	A lot of available resources	Hurt	Offer DBaaS task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Offer IAAS	Up to date market strategy	Help	Offer IAAS can help up to date market strategy by providing sales information that can allow better understanding of current situation on the market.
Amazon	Offer IAAS	Product life cycle	Help	Offer IAAS can help product life cycle softgoal by providing information about product sales, that can be then used to determine the stage of life of the product more precisely.
Amazon	Offer IAAS	Profitable	Help	Offer IAAS can help profitable softgoal by generating revenue from the product sales.
Amazon	Offer IAAS	Service level agreements	Help	Offer IAAS can help service level agreements, since service level agreements are usually only made after the product has been purchased by the customer.
Amazon	Offer IAAS	Distribution channels investigation	Help	Offer IAAS can help distribution channels investigation softgoal by providing information about sales thorough various distribution channels.
Amazon	Offer IAAS	Established and evaluated pricing model	Help	Offer IAAS can help established and evaluated pricing model by providing a real life information about the effectiveness of the currents pricing model.
Amazon	Offer IAAS	A lot of available resources	Hurt	Offer IAAS task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Sell directly competitive product	Up to date market strategy	Help	Sell directly competitive product can help up to date market strategy softgoal by providing sales information that can allow better understanding of current situation on the market.
Amazon	Sell directly competitive product	Product life cycle	Help	Sell directly competitive product can help product life cycle softgoal by providing information about product sales, that can be then used to determine the stage of life of the product more precisely.
Amazon	Sell directly competitive product	Profitable	Help	Sell directly competitive product can help profitable softgoal by generating revenue from the product sales.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon	Sell directly competitive product	Service level agreements	Help	Sell directly competitive product can help service level agreements, since service level agreements are usually only made after the product has been purchased by the customer.
Amazon	Sell directly competitive product	Distribution channels investigation	Help	Sell directly competitive product can help distribution channels investigation softgoal by providing information about sales thorough various distribution channels.
Amazon	Sell directly competitive product	Established and evaluated pricing model	Help	Sell directly competitive product can help established and evaluated pricing model by providing a real life information about the effectiveness of the currents pricing model.
Amazon	Sell directly competitive product	A lot of available resources	Hurt	Sell directly competitive product task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon	Sell complimentary product	Up to date market strategy	Help	Sell complimentary product can help up to date market strategy softgoal by providing sales information that can allow better understanding of current situation on the market.
Amazon	Sell complimentary product	Product life cycle	Help	Sell complimentary product can help product life cycle softgoal by providing information about product sales, that can be then used to determine the stage of life of the product more precisely.
Amazon	Sell complimentary product	Trustworthy	Help	Sell complimentary product can help trustworthy softgoal since creating a complimentary product implies long term collaboration or at least cohabitation of the two companies, where both companies depend on each other.
Amazon	Sell complimentary product	Profitable	Help	Sell complimentary product can help profitable softgoal by generating revenue from the product sales.
Amazon	Sell complimentary product	Service level agreements	Help	Sell complimentary product can help service level agreements, since service level agreements are usually only made after the product has been purchased by the customer.
Amazon	Sell complimentary product	Distribution channels investigation	Help	Sell complimentary product can help distribution channels investigation softgoal by providing information about sales thorough various distribution channels.
Amazon	Sell complimentary product	Established and evaluated pricing model	Help	Sell complimentary product can help established and evaluated pricing model by providing a real life information about the effectiveness of the currents pricing model.
Amazon	Sell complimentary product	A lot of available resources	Hurt	Sell complimentary product task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Amazon RDS	Analyze products	Good core asset roadmapping	Help	Analyze products task can help good core asset roadmapping softgoal by providing information about the developed assets that can be turned into core assets for the future reuse.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon RDS	Analyze products	Microsoft SQL be supported	Help	Analyze products task can help Microsoft SQL be supported softgoal by listing the strong and weak aspects of the product, that can help integrating the partner's product. Next, by providing partner's product roadmap that would list what features and chances are planned for the partner's products. This information can help keeping the product and partner's product well integrated in the long run.
Amazon RDS	Analyze products	MySQL, MariaDB, PostgreSQL, Oracle be supported	Help	Analyze products task can help MySQL, MariaDB, PostgreSQL, oracle be supported softgoal by listing the strong and weak aspects of the product, that can help integrating the partner's product. Next, by providing partner's product roadmap that would list what features and chances are planned for the partner's products. This information can help keeping the product and partner's product well integrated in the long run.
Amazon RDS	Analyze products	Amazon aurora be supported	Help	Analyze products task can help amazon aurora be supported softgoal by listing the strong and weak aspects of the product, that can help integrating the partner's product. Next, by providing partner's product roadmap that would list what features and chances are planned for the partner's products. This information can help keeping the product and partner's product well integrated in the long run.
Amazon RDS	Analyze products	Competitive efficiency	Help	Analyze products task can help competitive efficiency softgoal by pointing out the weak points in the product so that the efficiency of the product can be improved if any of those weak points hinder the efficiency.
Amazon RDS	Analyze products	Competitive simplicity	Help	Analyze products task can help competitive simplicity softgoal by pointing out the weak points related to the simplicity of the product so that they can be focused on and improved in the future.
Amazon RDS	Analyze trends	Products are well analyzed	Help	Analyze trends task can help products are well analyzed softgoal by providing context in the form of societal, technological and competitors trends so that the product analysis task can be performed in this context. By doing so, it would be more clear where the product is lagging behind and where the product is in the lead.
Amazon RDS	Analyze trends	Integration with machine learning tools be implemented	Help	Analyze trends task can help integration with machine learning tools be implemented softgoal due to the fact that machine learning techniques are a fairly new technological feature, analyzing this technological trend can make the win/loss analysis more accurate.
Amazon RDS	Analyze trends	Monitoring function be implemented	Help	Analyze trends task can help monitoring function be implemented softgoal by providing information about the latest advances in the field related to this feature so that future improvements can be planned better.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon RDS	Analyze trends	Failover be supported	Help	Analyze trends task can help failover be supported softgoal by providing information about the latest advances in the field related to this feature so that future improvements can be planned better.
Amazon RDS	Analyze trends	Replication be supported	Help	Analyze trends task can help replication be supported softgoal by providing information about the latest advances in the field related to this feature so that future improvements can be planned better.
Amazon RDS	Analyze trends	Backup and restore be supported	Help	Analyze trends task can help backup and restore be supported softgoal by providing information about the latest advances in the field related to this feature so that future improvements can be planned better.
Amazon RDS	Analyze trends	Identity and access management be implemented	Help	Analyze trends task can help identity and access management be implemented softgoal by providing information about the latest advances in the field related to this feature so that future improvements can be planned better.
Amazon RDS	Analyze trends	Data protection be implemented	Help	Analyze trends task can help data protection be implemented softgoal by providing information about the latest advances in the field related to this feature so that future improvements can be planned better.
Amazon RDS	Analyze trends	Free trials policy is implemented	Help	Analyze trends task can help free trials policy is implemented softgoal by providing knowledge about how the competitors are making such a marketing offer, as well as what the population of potential clients is most responsive to.
Amazon RDS	Analyze trends	Flexible pricing model is implemented	Help	Analyze trends task can help flexible pricing model is implemented softgoal by providing knowledge about how the competitors are making such a marketing offer, as well as what the population of potential clients is most responsive to.
Amazon RDS	Analyze trends	"Bring your own license" policy is implemented	Help	Analyze trends task can help "bring your own license" policy is implemented softgoal by providing knowledge about how the competitors are making such a marketing offer, as well as what the population of potential clients is most responsive to.
Amazon RDS	Improve core asset roadmapping	Good roadmap intelligence	Help	Improve core asset roadmapping task can help good roadmap intelligence softgoal by providing information about what core assets the company currently has.
Amazon RDS	Improve core asset roadmapping	Integration with machine learning tools be implemented	Help	Improve core asset roadmapping task can help integration with machine learning tools be implemented softgoal by providing existing core assets that can be reused for the new feature.
Amazon RDS	Improve core asset roadmapping	Monitoring function be implemented	Help	Improve core asset roadmapping task can help monitoring function be implemented softgoal by providing existing core assets that can be reused for the new feature.
Amazon RDS	Improve core asset roadmapping	Failover be supported	Help	Improve core asset roadmapping task can help failover be supported softgoal by providing existing core assets that can be reused for the new feature.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon RDS	Improve core asset roadmapping	Replication be supported	Help	Improve core asset roadmapping task can help replication be supported softgoal by providing existing core assets that can be reused for the new feature.
Amazon RDS	Improve core asset roadmapping	Backup and restore be supported	Help	Improve core asset roadmapping task can help backup and restore be supported softgoal by providing existing core assets that can be reused for the new feature.
Amazon RDS	Improve core asset roadmapping	Identity and access management be implemented	Help	Improve core asset roadmapping task can help identity and access management be implemented softgoal by providing existing core assets that can be reused for the new feature.
Amazon RDS	Improve core asset roadmapping	Data protection be implemented	Help	Improve core asset roadmapping task can help data protection be implemented softgoal by providing existing core assets that can be reused for the new feature.
Amazon RDS	Improve core asset roadmapping	Microsoft SQL be supported	Help	Improve core asset roadmapping task can help Microsoft SQL be supported softgoal by providing existing core assets that can be reused for the new feature.
Amazon RDS	Improve core asset roadmapping	MySQL, MariaDB, PostgreSQL, Oracle be supported	Help	Improve core asset roadmapping task can help MySQL, MariaDB, PostgreSQL, oracle be supported softgoal by providing existing core assets that can be reused for the new feature.
Amazon RDS	Improve core asset roadmapping	Amazon aurora be supported	Help	Improve core asset roadmapping task can help amazon aurora be supported softgoal by providing existing core assets that can be reused for the new feature.
Amazon RDS	Implement integration with machine learning tools	Competitive simplicity	Hurt	Implement integration with machine learning tools task can hurt competitive simplicity softgoal by adding a functional attribute to the system that would make the overall design of the system more complex.
Amazon RDS	Implement monitoring function	Failover be supported	Help	Implement monitoring function task can help failover be supported softgoal by providing tools to detect an outage and events that can lead to an outage.
Amazon RDS	Implement monitoring function	Backup and restore be supported	Help	Implement monitoring function task can help backup and restore be supported softgoal by allowing to automate the creation of backups under certain events.
Amazon RDS	Implement monitoring function	identity and access management be implemented	Help	Implement monitoring function task can help identity and access management be implemented softgoal by providing tools that can help monitor the access of various users and groups of users to the features of the service.
Amazon RDS	Implement monitoring function	Competitive efficiency	Hurt	Implement monitoring function task can hurt competitive efficiency softgoal by creating an extra computational needs in the form of the monitoring functional attribute.
Amazon RDS	Implement monitoring function	Competitive simplicity	Hurt	Implement monitoring function task can hurt competitive simplicity softgoal by introducing additional functional requirements to the system design that would make the overall system architecture more complex.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon RDS	Support failover	Competitive simplicity	Hurt	Support failover task can hurt competitive simplicity softgoal by introducing additional requirements to the system that can make the overall design of the system more complex.
Amazon RDS	Support replication	Competitive efficiency	Help	Support replication task can help competitive efficiency softgoal by introducing a feature that can make read operations performed on the database service more efficient.
Amazon RDS	Support replication	Competitive simplicity	Hurt	Support replication task can hurt competitive simplicity softgoal by introducing a new feature to the system that can make the overall design of the system more complex.
Amazon RDS	Support backup and restore	Failover be supported	Help	Support backup and restore task can help failover be supported softgoal by providing backup functionality to the failover system, which means that only a system that switches the production system to the backup copy of database in case of the outage would have to be implemented.
Amazon RDS	Support backup and restore	Replication be supported	Help	Support backup and restore task can help replication be supported softgoal by creating a backup of a current database that would act as a read only database for the purpose of handling high loads on the service.
Amazon RDS	Support backup and restore	Data protection be implemented	Hurt	Support backup and restore task can hurt data protection be implemented softgoal by exposing the database to the third party in case the backups of the database are not stored according to the right standards.
Amazon RDS	Support backup and restore	Competitive efficiency	Hurt	Support backup and restore task can hurt competitive efficiency softgoal by introducing a set of required operations in order to create backups of the system.
Amazon RDS	Support backup and restore	Competitive simplicity	Hurt	Support backup and restore task can hurt competitive simplicity softgoal by introducing a new feature to the system that can make the overall design of the system more complex.
Amazon RDS	Implement identity and access management	Data protection be implemented	Help	Implement identity and access management task can help data protection be implemented softgoal by only allowing actors with appropriate access rights the access to the data.
Amazon RDS	Implement identity and access management	Competitive simplicity	Hurt	Implement identity and access management task can hurt competitive simplicity softgoal by introducing a new feature to the system that can make the overall design of the system more complex.
Amazon RDS	Implement data protection	Monitoring function be implemented	Hurt	Implement data protection task can hurt monitoring function be implemented softgoal by making access to the data more difficult due to extra security layers.
Amazon RDS	Implement data protection	Failover be supported	Hurt	Implement data protection task can hurt failover be supported softgoal by making the failover system take into account the security layers in the system that aim to protect the data.
Amazon RDS	Implement data protection	Replication be supported	Hurt	Implement data protection task can hurt replication be supported softgoal by making the replication system take into account the security measures of the system aimed to protect the data.

Table 9: Continued

Actor	Contributor		Recipient	Type	Explanation
Amazon RDS	Implement data protection		Backup and restore be supported	Hurt	Implement data protection task can hurt backup and restore be supported softgoal by making the backup system take into account the security measures of the system aimed to protect the data.
Amazon RDS	Implement data protection		Identity and access management be implemented	Help	Implement data protection task can help identity and access management be implemented softgoal by providing a set of tools that can be used to assign access rights to the data to the certain actors.
Amazon RDS	Implement data protection		Competitive efficiency	Hurt	Implement data protection task can hurt competitive efficiency softgoal by creating additional security layers that can make storing the data more secure, yet the operations performed on the data can become less efficient.
Amazon RDS	Implement data protection		Competitive simplicity	Hurt	Implement data protection task can hurt competitive simplicity softgoal by introducing a new feature to the system that can make the overall design of the system more complex.
Amazon RDS	Support SQL	Microsoft	Replication be supported	Hurt	Support Microsoft SQL task can hurt replication be supported softgoal due to the fact that Microsoft SQL does not support the replication functionality out of the box, according to [58], hence such functionality would have to be omitted for the database or additional resources would need to be spent to develop such functionality.
Amazon RDS	Support SQL	Microsoft	Backup and restore be supported	Hurt	Support Microsoft SQL task can hurt backup and restore be supported softgoal due to the fact that such functionality would need to be developed and integrated with AWS management console.
Amazon RDS	Support SQL	Microsoft	Data protection be implemented	Hurt	Support Microsoft SQL task can hurt data protection be implemented softgoal due to the fact that this particular database can use its own unique database scheme notation that can differ from other databases, hence in order to implement data protection for this particular database, additional setup and development can be required.
Amazon RDS	Support SQL	Microsoft	Competitive efficiency	Hurt	Support Microsoft SQL task can hurt competitive efficiency softgoal due to the fact that increased interoperability would require additions to the system design, such as an interface layer that would allow working with multiple types of databases, yet would lack the capacity to be optimized to work efficiently with one particular type of the database.
Amazon RDS	Support SQL	Microsoft	Competitive simplicity	Hurt	Support Microsoft SQL task can hurt competitive simplicity softgoal by introducing a new feature to the system that can make the overall design of the system more complex.
Amazon RDS	Support MariaDB, PostgreSQL, Oracle	MySQL, PostgreSQL	Monitoring function be implemented	Hurt	Support MySQL, MariaDB, PostgreSQL, oracle task can hurt monitoring function be implemented softgoal because in order to implement the monitoring function with all of the aforementioned databases additional development and set up would have to be done.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Amazon RDS	Support MySQL, MariaDB, PostgreSQL, Oracle	Replication be supported	Help	Support MySQL, MariaDB, PostgreSQL, oracle task can help replication be supported softgoal by providing replication functionality out of the box.
Amazon RDS	Support MySQL, MariaDB, PostgreSQL, Oracle	Backup and restore be supported	Hurt	Support MySQL, MariaDB, PostgreSQL, oracle task can hurt backup and restore be supported softgoal due to the fact that such functionality would need to be developed and integrated with AWS management console.
Amazon RDS	Support MySQL, MariaDB, PostgreSQL, Oracle	Data protection be implemented	Hurt	Support MySQL, MariaDB, PostgreSQL, oracle task can hurt data protection be implemented softgoal due to the fact that this particular database can use its own unique database scheme notation that can differ from other databases, hence in order to implement data protection for this particular database, additional setup and development can be required.
Amazon RDS	Support MySQL, MariaDB, PostgreSQL, Oracle	Competitive efficiency	Hurt	Support MySQL, MariaDB, PostgreSQL, oracle task can hurt competitive efficiency softgoal due to the fact that increased interoperability would require additions to the system design, such as an interface layer that would allow working with multiple types of databases, yet would lack the capacity to be optimized to work efficiently with one particular type of the database.
Amazon RDS	Support MySQL, MariaDB, PostgreSQL, Oracle	Competitive simplicity	Hurt	Support MySQL, MariaDB, PostgreSQL, oracle task can hurt competitive simplicity softgoal by introducing a new feature to the system that can make the overall design of the system more complex.
Amazon RDS	Support Amazon Aurora	Monitoring function be implemented	Hurt	Support amazon aurora task can hurt monitoring function be implemented softgoal because in order to implement a monitoring function with this database additional development and set up would have to be done.
Amazon RDS	Support Amazon Aurora	Replication be supported	Hurt	Support amazon aurora task can hurt replication be supported softgoal due to the fact that the database might not support replication out of the box and additional development of this function, as well as additional setup can be required.
Amazon RDS	Support Amazon Aurora	Data protection be implemented	Hurt	Support amazon aurora task can hurt data protection be implemented softgoal due to the fact that this particular database can use its own unique database scheme notation that can differ from other databases, hence in order to implement data protection for this particular database, additional setup and development can be required.
Amazon RDS	Support Amazon Aurora	Competitive efficiency	Hurt	Support amazon aurora task can hurt competitive efficiency softgoal due to the fact that increased interoperability would require additions to the system design, such as an interface layer that would allow working with multiple types of databases, yet would lack the capacity to be optimized to work efficiently with one particular type of the database.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation	
Amazon RDS	Support Aurora	Amazon	Competitive simplicity	Hurt	Support amazon aurora task can hurt competitive simplicity softgoal by introducing a new feature to the system that can make the overall design of the system more complex.
Amazon RDS	Improve efficiency	Backup and restore be supported	Help	Help	Improve efficiency task can help backup and restore be supported softgoal by increasing the speed with which the backups are created and how fast a production database can be restored from the backup.
Amazon RDS	Improve efficiency	Data protection be implemented	Help	Help	Improve efficiency task can help data protection be implemented softgoal by introducing more efficient data protection mechanisms, e.g. more efficient encryption algorithms.
Amazon RDS	Improve efficiency	Competitive simplicity	Hurt	Hurt	Improve efficiency task can hurt competitive simplicity softgoal due to the fact that sometimes design decisions to make the system more efficient can make the system more complex, e.g. due to obscure and complex algorithms aimed at working with the data within the system.
Amazon RDS	Improve simplicity	Monitoring function be implemented	Help	Help	Improve simplicity task can help monitoring function be implemented softgoal due to the fact that it is usually easier to monitor a more simple system.
Amazon RDS	Improve simplicity	Competitive efficiency	Hurt	Hurt	Improve simplicity task can hurt competitive efficiency softgoal due to the fact that making a system more simple is often done by sacrificing some complex, yet efficient parts of the system.
Amazon RDS	Implement "Bring your own license" policy	"Bring your own license"	Flexible pricing model is implemented	Help	Implement "bring your own license" policy task can help flexible pricing model is implemented softgoal by making the pricing model even more flexible due to the fact that the customer would not need to have to pay for the license again if the customer already has the license.
Microsoft	Identify trends	market	Analysis of customer win/loss	Help	Identified market trends can help calculating the expected win/loss of the customer more accurately.
Microsoft	Identify trends	market	Analysis of competitors	Help	Identified market trends can help analyzing and understanding competitors better due to placing the competitors in the context of the market.
Microsoft	Identify trends	market	Product life cycle	Help	Identifying market trends can help managing portfolio innovation decision due to placing the innovation initiatives in the context of the future market situation.
Microsoft	Identify trends	market	Own product be well developed	Help	Knowing market trends can help developing own products by providing more context to what problems need to be solved by the software product in order to seize the market opportunities.
Microsoft	Identify trends	market	A lot of available resources	Hurt	Identify market trends task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Make a market strategy	Product life cycle	Product life cycle	Help	A defined market strategy can help product life cycle by putting the product in the context of the company's strategy.
Microsoft	Make a market strategy	Portfolio innovation decision	Portfolio innovation decision	Help	A defined market strategy can help portfolio innovation decision by placing such decisions in the context of the current market strategy.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft	Make a market strategy	Own product be well developed	Help	With a market strategy a more accurate plan for own software product development can be made. Such plan would be based on the parts of the market strategy that state, what markets segments need to be conquered and what are the prerequisites for that.
Microsoft	Make a market strategy	Profitable	Help	Typically, a market strategy of the company solves, among other problems, the problem of generating income in the current market.
Microsoft	Make a market strategy	R&D yield	Help	A defined market strategy can make one sided short term collaboration more effective due to the better understanding of the market situation. This can potentially increase the R&D yield of the company.
Microsoft	Make a market strategy	Acquisition capabilities	Help	A defined market strategy can improve acquisition capabilities of the company due to a better understanding of the situation of the market and how to act in such situation, e.g. what is the company's current budget for R&D acquisitions.
Microsoft	Make a market strategy	Partner's product generates revenue	Help	A defined market strategy usually includes the strategy for handling the assets of the company, in this case the strategy for managing the partner's product that is being reselled.
Microsoft	Make a market strategy	Effective DBaaS management	Help	A market strategy usually includes the manner in which own products, that are complimentary to the partner's products, are sold.
Microsoft	Make a market strategy	Effective IAAS management	Help	A market strategy usually includes the manner in which own products, that are complimentary to the partner's products, are sold.
Microsoft	Make a market strategy	Directly competitive product generates revenue	Help	A marketing strategy usually describes how the products of the company should be sold in the context of another product, that is directly competitive, on the market.
Microsoft	Make a market strategy	A lot of available resources	Hurt	Make a market strategy task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Analyze customer win/loss	Up to date market strategy	Help	Analyzing customer win/loss can help making marketing strategy more accurate and up to date due to a better understanding of a (typical) customer
Microsoft	Analyze customer win/loss	Product life cycle	Help	Product life cycle can benefit from knowing how customers use the product, what are the win/loss.
Microsoft	Analyze customer win/loss	Portfolio innovation decision	Help	Portfolio innovation decision can benefit from knowing what the current customer win/loss is, as well as the reasons for it. Those reasons can be stated as a problem that needs to be solved in the future.
Microsoft	Analyze customer win/loss	Business case analysis	Help	Business case analysis can benefit from more in depth knowledge of current customer win/loss.
Microsoft	Analyze customer win/loss	Own product be well developed	Help	Customer win/loss analysis can provide a very valuable context to what are the most important functional and quality requirements that the customer needs. With this knowledge, more accurate and complete requirements, as well as more efficient planning for own product development can be done.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft	Analyze win/loss	customer Service level agreements	Help	Service level agreements can benefit from knowing what customer win/loss are. Depending on how critical customer win are, the appropriate level of support can be offered.
Microsoft	Analyze win/loss	customer Established and evaluated pricing model	Help	Established and evaluated pricing model would be more accurate if customer win/loss is known.
Microsoft	Analyze win/loss	customer Complimentary product generates revenue	Help	Knowing customer win/loss allows to narrow down what needs to be addressed in order to improve customer win and decrease loss.
Microsoft	Analyze win/loss	customer A lot of available resources	Hurt	Analyze customer win/loss task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Analyze competitors	Up to date market strategy	Help	Knowing competitors can help shape market strategy better, e.g. make more informed decisions regarding cooperation or competition on a given segment of the market.
Microsoft	Analyze competitors	Portfolio innovation decision	Help	Portfolio innovation decision can be made more informed if there is knowledge of the competitors and their products.
Microsoft	Analyze competitors	Own product be well developed	Help	By knowing the strengths and weaknesses of the competitors, own product can be developed taking that into account, so that it would have more lucrative unique selling points.
Microsoft	Analyze competitors	Acquisition capabilities	Help	Knowing a lot about competitors can help acquiring companies by knowing what weaknesses the company has and what companies on the market can be purchased to bridge that gap.
Microsoft	Analyze competitors	Established and evaluated pricing model	Help	Having an analysis of the competitors can help better understand rationale behind their pricing model. Furthermore, knowing the pricing model of the competitors can serve as a reference point for the price model of the company.
Microsoft	Analyze competitors	Effective DBaaS management	Help	Knowing the competitors of the company can help understanding where the reselling product stands in comparison with the competitor's product.
Microsoft	Analyze competitors	Effective IAAS management	Help	Knowing the competitors of the company can help understanding where the reselling product stands in comparison with the competitor's product.
Microsoft	Analyze competitors	Directly competitive product generates revenue	Help	Knowing the product of the competitor can help positioning the product of the company on the market better.
Microsoft	Analyze competitors	Complimentary product generates revenue	Help	Better understanding of the competitor can help better understand what needs to be improved in the company's product in order for it to be competitive on the market.
Microsoft	Analyze competitors	A lot of available resources	Hurt	Analyze competitors task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Analyze product life cycle	Portfolio innovation decision	Help	Analyze product life cycle task can help portfolio innovation decision by providing the context, e.g. if the product is approaching the end of its life cycle a decision to focus more on the technological innovations for the next generation of the product.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft	Analyze product life cycle	Own product be well developed	Help	By knowing where the product is in it's life cycle, more rational decisions can be made regarding the product development, e.g. young products can receive more focus for new functional properties development, whereas with older products the focus can be shifted to the maintenance, bug patching and overall stability improvements.
Microsoft	Analyze product life cycle	Service level agreements	Help	Analyzing product life cycle can help service level agreements, e.g. by providing much more support to the products in the beginning of their life cycle and much lower level of support to the products in the end of their life cycle.
Microsoft	Analyze product life cycle	Acquisition capabilities	Help	Analyzing product life cycle can help acquisition capabilities, e.g. if the product is in the end of it's life cycle, a decision to acquire a product for the next generation of the company's product, instead of developing the next generation, can be made.
Microsoft	Analyze product life cycle	Established and evaluated pricing model	Help	Analyzing product life cycle can help established and evaluated pricing model, e.g. a price of the product can be dependent on the life cycle stage of the product, a newer product can be more expensive, than an old one.
Microsoft	Analyze product life cycle	Effective DBaaS management	Help	Analyzing product life cycle can help effective DBaaS management, since DBaaS management acts as an addition to the product, so certain management decisions regarding DBaaS can be made, e.g. "To what extent should DBaaS be improved?", "How long should DBaaS be actively developed for?".
Microsoft	Analyze product life cycle	Effective IAAS management	Help	Analyzing product life cycle can help effective IAAS management, since IAAS management acts as an addition to the product, so certain management decisions regarding IAAS can be made, e.g. "To what extent should IAAS be improved?", "How long should IAAS be actively developed for?".
Microsoft	Analyze product life cycle	Complimentary product generates revenue	Help	Analyzing product life cycle can help complimentary product generates revenue softgoal, e.g. more young products may receive more improvement efforts.
Microsoft	Analyze product life cycle	A lot of available resources	Hurt	Analyze product life cycle task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Decide on portfolio innovation	Product life cycle	Help	Decisions on portfolio innovations can influence product life cycle, e.g. if certain innovations are to be introduced in the current generation of the product or in the next one.
Microsoft	Decide on portfolio innovation	Portfolio scope analysis	Help	Decisions on portfolio innovation can influence portfolio scope analysis, e.g. should a gap in the market, defined by the market strategy, yet not covered by any products yet, be covered by expanding the functionality of one of the existing product or by developing an entirely new product.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft	Decide on portfolio innovation	Own product be well developed	Help	By deciding which trends to incorporate into the product, more accurate planning and more full requirements description can be done regarding own product.
Microsoft	Decide on portfolio innovation	Acquisition capabilities	Help	Decisions on portfolio innovation can influence acquisition capabilities, because instead of developing an innovative feature, core asset or a product, in some cases it can be purchased.
Microsoft	Decide on portfolio innovation	A lot of available resources	Hurt	Decide on portfolio innovation task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Analyze portfolio scope	Analysis of customer win/loss	Help	Analyze portfolio scope task can help analysis of customer win/loss softgoal by providing information regarding what gaps exist in the company portfolio, then analyzing why the customer did or did not choose company's products.
Microsoft	Analyze portfolio scope	Analysis of competitors	Help	Analyze portfolio scope task helps analysis of competitors softgoal by giving more information for comparison of competitor's products to the products of the company, as well as existing gaps in the functionality of company's portfolio of products and the functionality gaps in the competitor's product portfolio.
Microsoft	Analyze portfolio scope	Portfolio innovation decision	Help	Analyze portfolio scope can help portfolio innovation decision by stating the existing gaps in the company's portfolio. Such gaps can support the innovations aimed to bridge the gaps.
Microsoft	Analyze portfolio scope	Own product be well developed	Help	Analyze portfolio scope can help developing own product by giving more information about existing functionality gaps. If the decision to bridge such gaps is made, more accurate requirement description can be made for own product development.
Microsoft	Analyze portfolio scope	A lot of available resources	Hurt	Analyze portfolio scope task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Analyze business case	Analysis of customer win/loss	Help	Analyze business case task can help analysis of customer win/loss softgoal by providing information how well the product performs given the business case. With such context more conclusions can be drawn from customer win/loss analysis regarding why the customer chose to or not to purchase the product.
Microsoft	Analyze business case	Analysis of competitors	Help	Analyze business case task can help analysis of competitors by providing more context about how company's product performs given the business case. After that, this performance can be compared to the performance of the competitor's product.
Microsoft	Analyze business case	Product life cycle	Help	Analyze business case task can help product life cycle softgoal by giving more information about the business case the product is working with, so that during the product life cycle assessment the functionality of the product is evaluated against more accurate and updated business case.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation	
Microsoft	Analyze case	business	Portfolio innovation decision	Help	Analyze business case task can help portfolio innovation decision softgoal by providing a more updated and accurate business case, so that more informed decisions regarding incorporating market trends to tackle such business case can be made.
Microsoft	Analyze case	business	Portfolio scope analysis	Help	Analyze business case can help portfolio scope analysis by providing more up to date and detailed business case that can help identifying and estimating the current functionality gaps in the company product portfolio.
Microsoft	Analyze case	business	Own product be well developed	Help	Analyze business case can help own product development by providing more information about business cases. This way, during own product development, planning for the development of assets can be done by analyzing what functionality is missing from the software product.
Microsoft	Analyze case	business	Service level agreements	Help	Analyze business case can help service level agreements softgoal by providing more context to what aspects of the business case are of most importance to the customer and then adjusting the service level agreement to meet the demands of the business case.
Microsoft	Analyze case	business	A lot of available resources	Hurt	Analyze business case task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Product ment	develop-	Product life cycle	Help	Product development task can help product life cycle by sharing knowledge about technical aspects of the product, e.g. assets that are planned for development.
Microsoft	Product ment	develop-	Portfolio innovation decision	Help	Product development can help portfolio innovation decision, e.g. by sharing knowledge about how much resources are utilized right now for the development of the planned future assets.
Microsoft	Product ment	develop-	Intellectual property management	Help	Product development can help intellectual property management by using development practices that can protect intellectual properties, e.g. good licensing practices, security measures for storing source code.
Microsoft	Product ment	develop-	Established and evaluated pricing model	Help	Product development can help to evaluate the pricing model by providing information about how much resources were spent on the product.
Microsoft	Product ment	develop-	Effective DBaaS management	Help	Product development improves the functional and non-functional qualities of the DBaaS product.
Microsoft	Product ment	develop-	Effective IAAS management	Help	Product development improves the functional and non-functional qualities of the IAAS product.
Microsoft	Product ment	develop-	Directly competitive product generates revenue	Help	Product development can help directly competitive product generates revenue by further developing the directly competitive product, which usually leads to better product sales, since usually the more functional and the better non-functional attributes of the product are, the better the product sells.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft	Product development	Complimentary product generates revenue	Help	Product development can focus on complimentary product generates revenue softgoal by improving the functional and non-functional attributes that are most likely to improve the revenue generated by the product.
Microsoft	Product development	A lot of available resources	Hurt	Product development task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Long term collaboration	Up to date market trends	Help	Long term collaboration can help keeping market trends up to date by having more information about what other actors on the market are working on and what other actors on the market are interested in.
Microsoft	Long term collaboration	Product life cycle	Help	Long term collaboration task can help product life cycle by sharing knowledge about technical aspects of the product, e.g. assets that are planned for development.
Microsoft	Long term collaboration	Portfolio innovation decision	Help	Long term collaboration can help portfolio innovation decision, e.g. by sharing knowledge about how much resources are utilized right now for the development of the planned future assets.
Microsoft	Long term collaboration	Trustworthy	Help	Long term collaboration can increase the trust to the company, e.g. by showing other potential partners that the company can maintain and not break long term agreements.
Microsoft	Long term collaboration	Intellectual property management	Help	Long term collaboration can help intellectual property management by using development practices that can protect intellectual properties, e.g. good licensing practices, security measures for storing source code, defining clearly how the code created in collaboration can be used by all parties.
Microsoft	Long term collaboration	Established and evaluated pricing model	Help	Long term collaboration can help to evaluate the pricing model by providing information about how much resources were spent on the product.
Microsoft	Long term collaboration	Effective DBaaS management	Help	Long term collaboration improves the functional and non-functional qualities of the DBaaS product.
Microsoft	Long term collaboration	Effective IAAS management	Help	Long term collaboration improves the functional and non-functional qualities of the IAAS product.
Microsoft	Long term collaboration	Complimentary product generates revenue	Help	Long term collaboration can focus on complimentary product generates revenue by working on functional and non functional attributes that are most likely to improve the revenue from the product.
Microsoft	Long term collaboration	A lot of available resources	Hurt	Long term collaboration task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	One sided short term collaboration	Portfolio innovation decision	Help	One sided short term collaboration can help portfolio innovation decision, e.g. by sharing knowledge about what the partner is working on and how successful the clone of partner's innovation can be.
Microsoft	One sided short term collaboration	Trustworthy	Hurt	One sided short term collaboration can hurt the trustworthiness of the company by indicating to other actors on the market that the company finds it acceptable to break long term agreements for the sake of short term profit.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft	One sided short term collaboration	Intellectual property management	Help	One sided short term collaboration can help intellectual property management by using development practices that can protect intellectual properties, e.g. good licensing practices, security measures for storing source code, defining clearly how the code created in collaboration can be used by all parties.
Microsoft	One sided short term collaboration	Established and evaluated pricing model	Help	One sided short term collaboration can help to evaluate the pricing model by providing information about how much resources were spent on the product.
Microsoft	One sided short term collaboration	Effective DBaaS management	Help	One sided short term collaboration can improve the functional and non-functional qualities of the DBaaS product.
Microsoft	One sided short term collaboration	Effective IAAS management	Help	One sided short term collaboration can improve the functional and non-functional qualities of the IAAS product.
Microsoft	One sided short term collaboration	Directly competitive product generates revenue	Help	One sided short term collaboration can improve directly competitive product generates revenue by cloning the functional and non functional attributes of the competitive product.
Microsoft	One sided short term collaboration	A lot of available resources	Hurt	One sided short term collaboration task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Make acquisition	Established and evaluated pricing model	Help	Making an acquisition can improve established and evaluated pricing model by providing information about how much it cost to purchase the product and how the product needs to be sold to become profitable.
Microsoft	Make acquisition	Effective DBaaS management	Help	Make acquisition can help effective DBaaS management by providing assets that can improve DBaaS.
Microsoft	Make acquisition	Effective IAAS management	Help	Make acquisition can help effective IAAS management by providing assets that can improve IAAS.
Microsoft	Make acquisition	Directly competitive product generates revenue	Help	Make acquisition can help directly competitive product generates revenue by purchasing assets that can help make company's directly competitive product better.
Microsoft	Make acquisition	Complimentary product generates revenue	Help	Make acquisition can help complimentary product generates revenue by purchasing assets that can add to functional and non functional attributes of the product.
Microsoft	Make acquisition	A lot of available resources	Hurt	Make acquisition task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Develop service level agreements	Analysis of customer win/loss	Help	Develop service level agreements can help analysis of customer win/loss softgoal by providing information about what kind of support will be provided to the customer and how this support will benefit the customer.
Microsoft	Develop service level agreements	Business case analysis	Help	Develop service level agreements can help business case analysis by providing information about how service level agreement can benefit to the business case.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft	Develop service level agreements	Established and evaluated pricing model	Help	Develop service level agreements can help established and evaluated pricing model softgoal by providing information regarding how much it costs to provide service to the customer.
Microsoft	Develop service level agreements	Effective DBaaS management	Help	Develop service level agreements can help effective DBaaS management by providing additional support to the DBaaS.
Microsoft	Develop service level agreements	Effective IAAS management	Help	Develop service level agreements can help effective IAAS management by providing additional support to the IAAS.
Microsoft	Develop service level agreements	Directly competitive product generates revenue	Help	Develop service level agreements can help directly competitive product generates revenue by providing additional paid support to the product after it has been purchased by the customer.
Microsoft	Develop service level agreements	A lot of available resources	Hurt	Develop service level agreements task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Manage intellectual property	Own product be well developed	Help	Manage intellectual property can help own product be well developed by specifying the development and licensing practices, so that the source code is protected from the third parties and can not be used by other parties without the consent of the company.
Microsoft	Manage intellectual property	Shared R&D assets	Help	Manage intellectual property can help shared R&D assets by specifying how the assets developed by the company and it's partners can be used by each party.
Microsoft	Manage intellectual property	Acquired R&D assets	Help	Manage intellectual property can help acquired R&D assets by specifying how the newly acquired assets can be used by other parties, as well as ensuring that newly acquired assets' source code is stored in a safe manner.
Microsoft	Manage intellectual property	Effective DBaaS management	Help	Manage intellectual property can help Effective DBaaS management by ensuring all assets of the DBaaS are stored safely, have a proper license.
Microsoft	Manage intellectual property	Effective IAAS management	Help	Manage intellectual property can help Effective IAAS management by ensuring all assets of the IAAS are stored safely, have a proper license.
Microsoft	Manage intellectual property	Directly competitive product generates revenue	Help	Manage intellectual property can help directly competitive product generates revenue softgoal by making sure all assets are stored safely, all licenses of those assets are in order.
Microsoft	Manage intellectual property	A lot of available resources	Hurt	Manage intellectual property task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Investigate distribution channels	Up to date market trends	Help	Investigate distribution channels can help up to date market trends softgoal by providing knowledge about what distribution channels are currently the most effective, as well as knowledge about emerging distribution channels.
Microsoft	Investigate distribution channels	Up to date market strategy	Help	Investigate distribution channels can help up to date market strategy softgoal by giving knowledge about how certain distribution channels can help entering new market niches and/or solidifying company's position on a certain market niche.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft	Investigate distribution channels	Analysis of competitors	Help	Investigate distribution channels can help analysis of competitors softgoal by specifying how effective a given distribution channel is.
Microsoft	Investigate distribution channels	Own product be well developed	Help	Investigate distribution channels can help own product be well developed by specifying how the product needs to be distributed.
Microsoft	Investigate distribution channels	Intellectual property management	Help	Investigate distribution channels can help intellectual property management, e.g. by specifying what threat of piracy each distribution channel poses.
Microsoft	Investigate distribution channels	Partner's product generates revenue	Help	Investigate distribution channels can help partner's product generates revenue softgoal by choosing the distribution channel that generates most sales.
Microsoft	Investigate distribution channels	Effective DBaaS management	Help	Investigate distribution channels can help effective DBaaS management by e.g. specifying what distribution channel will generate most revenue from the sales of DBaaS.
Microsoft	Investigate distribution channels	Effective IAAS management	Help	Investigate distribution channels can help effective IAAS management by e.g. specifying what distribution channel will generate most revenue from the sales of IAAS.
Microsoft	Investigate distribution channels	Directly competitive product generates revenue	Help	Investigate distribution channels can help directly competitive product generates revenue softgoal by e.g. specifying what distribution channel is most likely to generate most revenue from the sale of directly competitive product.
Microsoft	Investigate distribution channels	A lot of available resources	Hurt	Investigate distribution channels task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Establish and evaluate pricing model	Up to date market strategy	Help	Establish and evaluate pricing model can help up to date market strategy softgoal by e.g. providing a current selling price of the product so that during the market strategy evaluation a decision can be made if the product is still viable.
Microsoft	Establish and evaluate pricing model	Analysis of customer win/loss	Help	Establish and evaluate pricing model can help analysis of customer win/loss, since the cost of the product is one of the factors the customer takes into account when choosing a product.
Microsoft	Establish and evaluate pricing model	Analysis of competitors	Help	Establish and evaluate pricing model can help analysis of competitors softgoal e.g. by comparing the price of the company's product to the price of the product the company is competing with.
Microsoft	Establish and evaluate pricing model	Profitable	Help	Establish and evaluate pricing model can help profitable softgoal, since one of the goals of the pricing model is to maximize the revenue from the product.
Microsoft	Establish and evaluate pricing model	Distribution channels investigation	Help	Establish and evaluate pricing model can help distribution channels investigation softgoal by specifying what pricing models can be used for certain distribution channels.
Microsoft	Establish and evaluate pricing model	Partner's product generates revenue	Help	Establish and evaluate pricing model can help partner's product generates revenue softgoal by specifying a price of the product so that it generates most revenue.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft	Establish and evaluate pricing model	Effective DBaaS management	Help	Establish and evaluate pricing model can help effective DBaaS management softgoal by specifying an optimal price for the unit of DBaaS so that it generates most revenue.
Microsoft	Establish and evaluate pricing model	Effective IAAS management	Help	Establish and evaluate pricing model can help effective IAAS management softgoal by specifying an optimal price for the unit of IAAS so that it generates most revenue.
Microsoft	Establish and evaluate pricing model	Directly competitive product generates revenue	Help	Establish and evaluate pricing model can help directly competitive product generates revenue softgoal by providing a specific price that would maximize the revenue of the product.
Microsoft	Establish and evaluate pricing model	Complimentary product generates revenue	Help	Establish and evaluate pricing model can help complimentary product generates revenue by specifying what pricing model would maximize the revenue from the sales of the product.
Microsoft	Establish and evaluate pricing model	A lot of available resources	Hurt	Establish and evaluate pricing model task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Sell product as is	Up to date market strategy	Help	Sell product as is can help up to date market strategy by providing sales information that can allow better understanding of current situation on the market.
Microsoft	Sell product as is	Product life cycle	Help	Sell product as is can help product life cycle softgoal by providing information about product sales, that can be then used to determine the stage of life of the product more precisely.
Microsoft	Sell product as is	Profitable	Help	Sell product as is can help profitable softgoal by generating revenue from the product sales.
Microsoft	Sell product as is	Service level agreements	Help	Sell product as is can help service level agreements, since service level agreements are usually only made after the product has been purchased by the customer.
Microsoft	Sell product as is	Distribution channels investigation	Help	Sell product as is can help distribution channels investigation softgoal by providing information about sales thorough various distribution channels.
Microsoft	Sell product as is	Established and evaluated pricing model	Help	Sell product as is can help established and evaluated pricing model by providing a real life information about the effectiveness of the currents pricing model.
Microsoft	Sell product as is	A lot of available resources	Hurt	Sell product as is task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Offer DBaaS	Up to date market strategy	Help	Offer DBaaS can help up to date market strategy by providing sales information that can allow better understanding of current situation on the market.
Microsoft	Offer DBaaS	Product life cycle	Help	Offer DBaaS can help product life cycle softgoal by providing information about product sales, that can be then used to determine the stage of life of the product more precisely.
Microsoft	Offer DBaaS	Profitable	Help	Offer DBaaS can help profitable softgoal by generating revenue from the product sales.
Microsoft	Offer DBaaS	Service level agreements	Help	Offer DBaaS can help service level agreements, since service level agreements are usually only made after the product has been purchased by the customer.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft	Offer DBaaS	Distribution channels investigation	Help	Offer DBaaS can help distribution channels investigation softgoal by providing information about sales thorough various distribution channels.
Microsoft	Offer DBaaS	Established and evaluated pricing model	Help	Offer DBaaS can help established and evaluated pricing model by providing a real life information about the effectiveness of the currents pricing model.
Microsoft	Offer DBaaS	A lot of available resources	Hurt	Offer DBaaS task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Offer IAAS	Up to date market strategy	Help	Offer IAAS can help up to date market strategy by providing sales information that can allow better understanding of current situation on the market.
Microsoft	Offer IAAS	Product life cycle	Help	Offer IAAS can help product life cycle softgoal by providing information about product sales, that can be then used to determine the stage of life of the product more precisely.
Microsoft	Offer IAAS	Profitable	Help	Offer IAAS can help profitable softgoal by generating revenue from the product sales.
Microsoft	Offer IAAS	Service level agreements	Help	Offer IAAS can help service level agreements, since service level agreements are usually only made after the product has been purchased by the customer.
Microsoft	Offer IAAS	Distribution channels investigation	Help	Offer IAAS can help distribution channels investigation softgoal by providing information about sales thorough various distribution channels.
Microsoft	Offer IAAS	Established and evaluated pricing model	Help	Offer IAAS can help established and evaluated pricing model by providing a real life information about the effectiveness of the currents pricing model.
Microsoft	Offer IAAS	A lot of available resources	Hurt	Offer IAAS task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Sell directly competitive product	Up to date market strategy	Help	Sell directly competitive product can help up to date market strategy softgoal by providing sales information that can allow better understanding of current situation on the market.
Microsoft	Sell directly competitive product	Product life cycle	Help	Sell directly competitive product can help product life cycle softgoal by providing information about product sales, that can be then used to determine the stage of life of the product more precisely.
Microsoft	Sell directly competitive product	Profitable	Help	Sell directly competitive product can help profitable softgoal by generating revenue from the product sales.
Microsoft	Sell directly competitive product	Service level agreements	Help	Sell directly competitive product can help service level agreements, since service level agreements are usually only made after the product has been purchased by the customer.
Microsoft	Sell directly competitive product	Distribution channels investigation	Help	Sell directly competitive product can help distribution channels investigation softgoal by providing information about sales thorough various distribution channels.
Microsoft	Sell directly competitive product	Established and evaluated pricing model	Help	Sell directly competitive product can help established and evaluated pricing model by providing a real life information about the effectiveness of the currents pricing model.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft	Sell directly competitive product	A lot of available resources	Hurt	Sell directly competitive product task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft	Sell complimentary product	Up to date market strategy	Help	Sell complimentary product can help up to date market strategy softgoal by providing sales information that can allow better understanding of current situation on the market.
Microsoft	Sell complimentary product	Product life cycle	Help	Sell complimentary product can help product life cycle softgoal by providing information about product sales, that can be then used to determine the stage of life of the product more precisely.
Microsoft	Sell complimentary product	Trustworthy	Help	Sell complimentary product can help trustworthy softgoal since creating a complimentary product implies long term collaboration or at least cohabitation of the two companies, where both companies depend on each other.
Microsoft	Sell complimentary product	Profitable	Help	Sell complimentary product can help profitable softgoal by generating revenue from the product sales.
Microsoft	Sell complimentary product	Service level agreements	Help	Sell complimentary product can help service level agreements, since service level agreements are usually only made after the product has been purchased by the customer.
Microsoft	Sell complimentary product	Distribution channels investigation	Help	Sell complimentary product can help distribution channels investigation softgoal by providing information about sales thorough various distribution channels.
Microsoft	Sell complimentary product	Established and evaluated pricing model	Help	Sell complimentary product can help established and evaluated pricing model by providing a real life information about the effectiveness of the currents pricing model.
Microsoft	Sell complimentary product	A lot of available resources	Hurt	Sell complimentary product task can hurt a lot of available resources softgoal by spending the resources to achieve a particular task.
Microsoft SQL	Analyze products	Machine learning on Linux is implemented	Help	Analyze products task can help machine learning on Linux is implemented softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	Input data partitioning is implemented	Help	Analyze products task can help input data partitioning is implemented softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	Failover cluster support is implemented	Help	Analyze products task can help failover cluster support is implemented softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Analyze products	Java language extension is implemented	Help	Analyze products task can help Java language extension is implemented softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	ETL is supported	Help	Analyze products task can help ETL is supported softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	Data virtualization is supported	Help	Analyze products task can help data virtualization is supported softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	SQL data discovery and classification is supported	Help	Analyze products task can help SQL data discovery and classification is supported softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	Always encrypted with Secure Enclaves is supported	Help	Analyze products task can help always encrypted with secure enclaves is supported softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	Vulnerability assessment is supported	Help	Analyze products task can help vulnerability assessment is supported softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	Certificate management functionality in SQL Server configuration manager is supported	Help	Analyze products task can help certificate management functionality in SQL server configuration manager is supported softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	Competitive other security aspects	Help	Analyze products task can help competitive other security aspects softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Analyze products	Persistent Memory devices are supported	Help	Analyze products task can help persistent memory devices are supported softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	High performance of columnstore indexes	Help	Analyze products task can help high performance of columnstore indexes softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	Competitive other performance aspects	Help	Analyze products task can help competitive other performance aspects softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	Compatible with Linux	Help	Analyze products task can help compatible with Linux softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	A lot of container options	Help	Analyze products task can help a lot of container options softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	A lot of language options	Help	Analyze products task can help a lot of language options softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	A lot of platform options	Help	Analyze products task can help a lot of platform options softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	High availability configuration for SQL Server running in containers	Help	Analyze products task can help high availability configuration for SQL server running in containers softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Analyze products	Support of a large number of synchronous replica pairs	Help	Analyze products task can help support of a large number of synchronous replica pairs softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	Efficient scale-out with automatic redirection of connection based on read/write intent	Help	Analyze products task can help efficient scale-out with automatic redirection of connection based on read/write intent softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	High availability with remote storage on Kubernetes	Help	Analyze products task can help high availability with remote storage on Kubernetes softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	Competitive other availability aspects	Help	Analyze products task can help competitive other availability aspects softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze products	Competitive simplicity	Help	Analyze products task can help competitive simplicity softgoal by providing an analysis of weak and strong points of the product. This can help during the software attribute development by providing context about which aspects of the product have what priority.
Microsoft SQL	Analyze trends	Analyzed products	Help	Analyze trends task can help analyzed products softgoal by giving context to the product analysis in the form of described trends. With this context, the product can be evaluated more accurately, it's weak and strong sides can be analyzed in the context of those trends, so that better decisions can be made regarding future product improvement.
Microsoft SQL	Analyze trends	Machine learning on Linux is implemented	Help	Analyze trends task can help machine learning on Linux is implemented softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Input data partitioning is implemented	Help	Analyze trends task can help input data partitioning is implemented softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Analyze trends	Failover cluster support is implemented	Help	Analyze trends task can help failover cluster support is implemented softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Java language extension is implemented	Help	Analyze trends task can help Java language extension is implemented softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	ETL is supported	Help	Analyze trends task can help ETL is supported softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Data virtualization is supported	Help	Analyze trends task can help data virtualization is supported softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	SQL data discovery and classification is supported	Help	Analyze trends task can help SQL data discovery and classification is supported softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Always encrypted with Secure Enclaves is supported	Help	Analyze trends task can help always encrypted with secure enclaves is supported softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Vulnerability assessment is supported	Help	Analyze trends task can help vulnerability assessment is supported softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Analyze trends	Certificate management functionality in SQL Server configuration manager is supported	Help	Analyze trends task can help vulnerability assessment is supported softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Competitive other security aspects	Help	Analyze trends task can help competitive other security aspects softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Persistent Memory devices are supported	Help	Analyze trends task can help persistent memory devices are supported softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	High performance of columnstore indexes	Help	Analyze trends task can help high performance of columnstore indexes softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Competitive other performance aspects	Help	Analyze trends task can help competitive other performance aspects softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Compatible with Linux	Help	Analyze trends task can help compatible with Linux softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	A lot of container options	Help	Analyze trends task can help a lot of container options softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	A lot of language options	Help	Analyze trends task can help a lot of language options softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Analyze trends	A lot of platform options	Help	Analyze trends task can help a lot of platform options softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	High availability configuration for SQL Server running in containers	Help	Analyze trends task can help high availability configuration for SQL server running in containers softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Support of a large number of synchronous replica pairs	Help	Analyze trends task can help support of a large number of synchronous replica pairs softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Efficient scale-out with automatic redirection of connection based on read/write intent	Help	Analyze trends task can help efficient scale-out with automatic redirection of connection based on read/write intent softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	High availability with remote storage on Kubernetes	Help	Analyze trends task can help high availability with remote storage on Kubernetes softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Competitive other availability aspects	Help	Analyze trends task can help competitive other availability aspects softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Competitive simplicity	Help	Analyze trends task can help competitive simplicity softgoal by providing the trend context to the software attribute, so that the priority of this software attribute can be set more appropriately. Next, the way such software attribute is developed can also be influenced by the trends, e.g. technological trend.
Microsoft SQL	Analyze trends	Good core asset roadmapping	Help	Analyze trends task can help good core asset roadmapping softgoal by providing information regarding what trends there are. Using this knowledge, a better understanding of what core assets need to be developed can be achieved.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Implement machine learning on Linux	Analyzed products	Help	Implement machine learning on Linux task can help analyzed products softgoal by providing software attribute description, how it contributes to the product, what requirements it has.
Microsoft SQL	Implement machine learning on Linux	Analyzed trends	Help	Implement machine learning on Linux task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Implement machine learning on Linux	Competitive other performance aspects	Hurt	Implement machine learning on Linux task can hurt competitive other performance aspects softgoal due to the fact that machine learning functionality can require additional performance resources.
Microsoft SQL	Implement machine learning on Linux	Compatible with Linux	Help	Implement machine learning on Linux task can help compatible with Linux softgoal by bringing a feature to the Linux platform.
Microsoft SQL	Implement machine learning on Linux	Competitive simplicity	Hurt	Implement machine learning on Linux task can hurt competitive simplicity softgoal by introducing an additional software attribute to the product that would make the overall design more complex.
Microsoft SQL	Implement input data partitioning	Analyzed products	Help	Implement input data partitioning task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Implement input data partitioning	Analyzed trends	Help	Implement input data partitioning task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Implement input data partitioning	Competitive other security aspects	Hurt	Implement input data partitioning task can hurt competitive other security aspects softgoal due to the fact that the functional attribute allows the use of the external code. Such code can contain vulnerabilities and can lead to the unexpected behavior of the system.
Microsoft SQL	Implement input data partitioning	Competitive other performance aspects	Help	Implement input data partitioning task can help competitive other performance aspects softgoal due to the fact that the functional attribute allows the execution of tasks in parallel.
Microsoft SQL	Implement input data partitioning	Compatible with Linux	Hurt	Implement input data partitioning task can hurt compatible with Linux softgoal due to the fact that the proposed functionality can only be supported on Windows at the moment.
Microsoft SQL	Implement input data partitioning	A lot of language options	Help	Implement input data partitioning task can hurt compatible with Linux softgoal due to the fact that the proposed functionality can only be supported on Windows at the moment.
Microsoft SQL	Implement input data partitioning	Competitive simplicity	Hurt	Implement input data partitioning task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Implement failover cluster support	Analyzed products	Help	Implement failover cluster support task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Implement failover cluster support	Analyzed trends	Help	Implement failover cluster support task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Implement failover cluster support	Competitive other performance aspects	Hurt	Implement failover cluster support task can hurt competitive other performance aspects softgoal due to the fact that the system would need to spend resources on the upkeep of the failover cluster.
Microsoft SQL	Implement failover cluster support	Compatible with Linux	Hurt	Implement failover cluster support task can hurt compatible with Linux softgoal due to the fact that in the 2019 version of the product this software attribute is only supported on Windows.
Microsoft SQL	Implement failover cluster support	Competitive other availability aspects	Help	Implement failover cluster support task can help competitive other availability aspects softgoal because this software attribute directly aims to improve the uptime of the system.
Microsoft SQL	Implement failover cluster support	Competitive simplicity	Hurt	Implement failover cluster support task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Implement Java language extension	Analyzed products	Help	Implement Java language extension task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Implement Java language extension	Analyzed trends	Help	Implement Java language extension task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Implement Java language extension	Competitive other security aspects	Hurt	Implement Java language extension task can hurt competitive other security aspects softgoal due to the fact that external Java code and used Java runtime can introduce new bugs and vulnerabilities.
Microsoft SQL	Implement Java language extension	Competitive other performance aspects	Help	Implement Java language extension task can help competitive other performance aspects softgoal by allowing to run the code closer to the data.
Microsoft SQL	Implement Java language extension	A lot of language options	Help	Implement Java language extension task can help a lot of language options softgoal by implementing the Java support for the product.
Microsoft SQL	Implement Java language extension	Competitive simplicity	Hurt	Implement Java language extension task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Support ETL	Analyzed products	Help	Support ETL task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Support ETL	Analyzed trends	Help	Support ETL task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Support ETL	Always encrypted with Secure Enclaves is supported	Hurt	Support ETL task can hurt always encrypted with secure enclaves is supported softgoal by copying the data outside of the secure enclave, hence canceling out the security advantage provided by this security measure.
Microsoft SQL	Support ETL	Competitive other security aspects	Hurt	Support ETL task can hurt competitive other security aspects softgoal due to to e.g. copying the data outside of the system and not following all the security standards prescribed to the system.
Microsoft SQL	Support ETL	Competitive other performance aspects	Hurt	Support ETL task can hurt competitive other performance aspects softgoal due to the fact that in the Microsoft SQL Server 2019 whitepaper [60] ETL process is not regarded as the most efficient data management approach.
Microsoft SQL	Support ETL	Compatible with Linux	Help	Support ETL task can help compatible with Linux softgoal due to the fact that ETL is a mature technology that can run on a lot of platforms.
Microsoft SQL	Support ETL	Competitive simplicity	Hurt	Support ETL task can hurt competitive simplicity softgoal due to the fact that developing and maintaining ETL infrastructure is a resource demanding task.
Microsoft SQL	Support data virtualization	Analyzed Products	Help	Support data virtualization task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Support data virtualization	Analyzed trends	Help	Support data virtualization task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Support data virtualization	Competitive other performance aspects	Help	Support data virtualization task can help competitive other performance aspects softgoal due to the fact that in the Microsoft SQL Server 2019 whitepaper [60] this alternative to ETL is regarded as a more efficient one.
Microsoft SQL	Support data virtualization	Compatible with Linux	Hurt	Support data virtualization task can hurt compatible with Linux softgoal due to the fact that the whitepaper [60] does not state if this software attribute is available on the other platforms.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Support data virtualization	Competitive simplicity	Hurt	Support data virtualization task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Support SQL data discovery and classification Support data virtualization Support data virtualization	Analyzed products	Help	Support SQL data discovery and classification support data virtualization support data virtualization task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Support SQL data discovery and classification Support data virtualization Support data virtualization	Analyzed trends	Help	Support SQL data discovery and classification support data virtualization support data virtualization task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Support SQL data discovery and classification Support data virtualization Support data virtualization	Competitive other security aspects	Help	Support SQL data discovery and classification support data virtualization support data virtualization task can help competitive other security aspects softgoal by providing an easy to use mechanism for sensitive data protection.
Microsoft SQL	Support SQL data discovery and classification Support data virtualization Support data virtualization	Competitive other performance aspects	Hurt	Support SQL data discovery and classification support data virtualization support data virtualization task can hurt competitive other performance aspects because this data protection feature can require additional resources.
Microsoft SQL	Support SQL data discovery and classification Support data virtualization Support data virtualization	Competitive simplicity	Hurt	Support SQL data discovery and classification support data virtualization support data virtualization task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Support always encrypted with Secure Enclaves	Analyzed products	Help	Support always encrypted with secure enclaves task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Support always encrypted with Secure Enclaves	Analyzed trends	Help	Support always encrypted with secure enclaves task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Support always encrypted with Secure Enclaves	Competitive other security aspects	Help	Support always encrypted with secure enclaves task can help competitive other security aspects softgoal by providing additional functionality for data protection.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Support always encrypted with Secure Enclaves	Competitive other performance aspects	Hurt	Support always encrypted with secure enclaves task can hurt competitive other performance aspects softgoal by creating additional computational demands in order for the encryption software attribute of the product to be working.
Microsoft SQL	Support always encrypted with Secure Enclaves	Competitive simplicity	Hurt	Support always encrypted with secure enclaves task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Support vulnerability assessment	Analyzed products	Help	Support vulnerability assessment task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Support vulnerability assessment	Analyzed trends	Help	Support vulnerability assessment task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Support vulnerability assessment	Failover cluster support is implemented	Help	Support vulnerability assessment task can help failover cluster support is implemented softgoal by providing knowledge regarding if the failover cluster is configured correctly and according to the best practices in security.
Microsoft SQL	Support vulnerability assessment	Always encrypted with Secure Enclave is supported	Help	Support vulnerability assessment task can help always encrypted with secure enclave is supported softgoal by providing knowledge regarding if the software attribute is configured correctly and according to the best practices in security.
Microsoft SQL	Support vulnerability assessment	Competitive other security aspects	Help	Support vulnerability assessment task can help competitive other security aspects softgoal by providing knowledge about the best practices for the security.
Microsoft SQL	Support vulnerability assessment	Competitive other performance aspects	Hurt	Support vulnerability assessment task can hurt competitive other performance aspects softgoal due to the fact that the system to scan and suggest best security practices can be resource demanding.
Microsoft SQL	Support vulnerability assessment	Competitive simplicity	Hurt	Support vulnerability assessment task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Support Certificate management functionality in SQL Server configuration manager	Analyzed products	Help	Support certificate management functionality in SQL server configuration manager task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Support Certificate management functionality in SQL Server configuration manager	Analyzed trends	Help	Support certificate management functionality in SQL server configuration manager task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Support Certificate management functionality in SQL Server configuration manager	Failover cluster support is implemented	Help	Support certificate management functionality in SQL server configuration manager task can help failover cluster support is implemented softgoal by providing the easy to use functionality to manage certificates. Those certificates allow to establish a protected tunnel to transfer data between the main database and the failover database.
Microsoft SQL	Support Certificate management functionality in SQL Server configuration manager	Competitive other security aspects	Help	Support certificate management functionality in SQL server configuration manager task can help competitive other security aspects softgoal by providing a functionality that allows to manage certificates that are used for secure data transfer.
Microsoft SQL	Support Certificate management functionality in SQL Server configuration manager	Compatible with Linux	Hurt	Support certificate management functionality in SQL server configuration manager task can hurt compatible with Linux softgoal due to the fact that the 2019 Microsoft SQL whitepaper [60] does not explicitly state the support of this functionality on Linux.
Microsoft SQL	Support Certificate management functionality in SQL Server configuration manager	Competitive simplicity	Hurt	Support certificate management functionality in SQL server configuration manager task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Improve other security aspects	Analyze products	Help	Improve other security aspects task can help analyze products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Improve other security aspects	Analyzed trends	Help	Improve other security aspects task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Improve other security aspects	Competitive other performance aspects	Hurt	Improve other security aspects task can hurt competitive other performance aspects softgoal due to the fact that certain security measures can make access to the data more complex and would require additional commutative resources.
Microsoft SQL	Improve other security aspects	A lot of language options	Hurt	Improve other security aspects task can hurt a lot of language options softgoal due to the fact that some security measures can impose certain security standards on the system, which would lead to the integration of other languages with the system being more complex.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Improve other security aspects	Competitive other availability aspects	Help	Improve other security aspects task can help competitive other availability aspects softgoal by making the system more secure and resilient to the threats from the outside, e.g. denial of service attacks.
Microsoft SQL	Improve other security aspects	Competitive simplicity	Hurt	Improve other security aspects task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Support Persistent Memory devices	Analyzed products	Help	Support persistent memory devices task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Support Persistent Memory devices	Analyzed trends	Help	Support persistent memory devices task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Support Persistent Memory devices	Competitive other performance aspects	Help	Support persistent memory devices task can help competitive other performance aspects softgoal due to the fact that PMEM devices allow faster read/write operations.
Microsoft SQL	Support Persistent Memory devices	Compatible with Linux	Hurt	Support persistent memory devices task can hurt compatible with Linux softgoal due to the fact that the whitepaper [60] does not explicitly state if this feature is supported on Linux.
Microsoft SQL	Support Persistent Memory devices	Competitive other availability aspects	Help	Support persistent memory devices task can help competitive other availability aspects softgoal by increasing the maximum capacity of read/write operations for the system hence increasing the availability of the whole system under the high load.
Microsoft SQL	Support Persistent Memory devices	Competitive simplicity	Hurt	Support persistent memory devices task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Improve performance of columnstore indexes	Analyzed products	Help	Improve performance of columnstore indexes task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Improve performance of columnstore indexes	Analyzed trends	Help	Improve performance of columnstore indexes task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Improve performance of columnstore indexes	Competitive other performance aspects	Help	Improve performance of columnstore indexes task can help competitive other performance aspects softgoal by increasing the speed with which the database works with column side indexes.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Improve performance of columnstore indexes	Competitive other availability aspects	Help	Improve performance of columnstore indexes task can help competitive other availability aspects softgoal by increasing the maximum capacity of read/write operations for the system hence increasing the availability of the whole system under the high load.
Microsoft SQL	Improve performance of columnstore indexes	Competitive simplicity	Hurt	Improve performance of columnstore indexes task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Improve other performance aspects	Analyzed products	Help	Improve other performance aspects task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Improve other performance aspects	SQL data discovery and classification is supported	Help	Improve other performance aspects task can help SQL data discovery and classification is supported softgoal due to the fact that the systems with higher performance can handle those tasks faster.
Microsoft SQL	Improve other performance aspects	Always encrypted with Secure Enclaves is supported	Help	Improve other performance aspects task can help always encrypted with secure enclaves is supported softgoal by increasing the encryption and decryption speed within the system.
Microsoft SQL	Improve other performance aspects	Competitive other security aspects	Hurt	Improve other performance aspects task can hurt competitive other security aspects softgoal due to the fact that some design decisions that are aimed to improve the performance of the system can not meet the security standards of the system.
Microsoft SQL	Improve other performance aspects	A lot of language options	Hurt	Improve other performance aspects task can hurt a lot of language options softgoal due to the fact that some design decisions aimed to improve the performance of the system can have a heavy dependency on some languages and not support other languages.
Microsoft SQL	Improve other performance aspects	A lot of platform options	Hurt	Improve other performance aspects task can hurt a lot of platform options softgoal due to the fact that some design decisions aimed to improve the performance of the product can have a heavy dependency on a certain platform or platforms and be incompatible with other platforms.
Microsoft SQL	Improve other performance aspects	Competitive other availability aspects	Help	Improve other performance aspects task can help competitive other availability aspects softgoal by by increasing the maximum capacity of read/write operations for the system hence increasing the availability of the whole system under the high load.
Microsoft SQL	Improve other performance aspects	Competitive simplicity	Hurt	Improve other performance aspects task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Improve Linux compatibility	Analyzed products	Help	Improve Linux compatibility task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Improve Linux compatibility	Analyzed trends	Help	Improve Linux compatibility task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Improve Linux compatibility	Machine learning on Linux is implemented	Help	Improve Linux compatibility task can help machine learning on Linux is implemented softgoal by making the software attribute run on Linux faster, more reliable, etc.
Microsoft SQL	Improve Linux compatibility	Competitive other security aspects	Hurt	Improve Linux compatibility task can hurt competitive other security aspects softgoal due to the fact that running the product on another operation system can create unforeseen security issues.
Microsoft SQL	Improve Linux compatibility	Competitive other performance aspects	Hurt	Improve Linux compatibility task can hurt competitive other performance aspects softgoal due to the fact that the Microsoft SQL server is a native product for the Windows operation system and might not be as well optimized for the Linux system.
Microsoft SQL	Improve Linux compatibility	A lot of language options	Help	Improve Linux compatibility task can help a lot of language options softgoal due to the fact that Linux operation system supports a wide variety of languages, some of which can only be supported on the Linux system.
Microsoft SQL	Improve Linux compatibility	A lot of platform options	Help	Improve Linux compatibility task can help a lot of platform options softgoal due to the fact that Linux supports a wide variety of platforms, some of which can only be available on Linux.
Microsoft SQL	Improve Linux compatibility	Competitive other availability aspects	Help	Improve Linux compatibility task can help competitive other availability aspects softgoal due to the fact that certain configurations of the Linux system are regarded as one of the most reliable systems for the servers on the market.
Microsoft SQL	Improve Linux compatibility	Competitive simplicity	Hurt	Improve Linux compatibility task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Add more container options	Analyzed products	Help	Add more container options task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Add more container options	Analyzed trends	Help	Add more container options task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Add more container options	Competitive other security aspects	Hurt	Add more container options task can hurt competitive other security aspects softgoal due to the fact that every new container the system supports would have it's own security vulnerabilities.
Microsoft SQL	Add more container options	Competitive other performance aspects	Hurt	Add more container options task can hurt competitive other performance aspects softgoal due to the fact that the product can be not very well optimized for a certain container.
Microsoft SQL	Add more container options	Compatible with Linux	Help	Add more container options task can help compatible with Linux softgoal by giving more container options to run on the Linux system.
Microsoft SQL	Add more container options	A lot of platform options	Help	Add more container options task can help a lot of platform options softgoal by giving more options of what container to run on a certain platform.
Microsoft SQL	Add more container options	Competitive simplicity	Hurt	Add more container options task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Add more language options	Analyzed products	Help	Add more language options task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Add more language options	Analyzed trends	Help	Add more language options task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Add more language options	Competitive other security aspects	Hurt	Add more language options task can hurt competitive other security aspects softgoal since every new language supported by the product would have it's own set of security vulnerabilities.
Microsoft SQL	Add more language options	Competitive other performance aspects	Hurt	Add more language options task can hurt competitive other performance aspects softgoal due to the fact that the increased interoperability can lead to the lack of proper optimization for each language.
Microsoft SQL	Add more language options	Compatible with Linux	Help	Add more language options task can help compatible with Linux softgoal by giving more options what language to use, some of those languages can be better supported by Linux than the others.
Microsoft SQL	Add more language options	Competitive simplicity	Hurt	Add more language options task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Add more platform options	Analyzed products	Help	Add more platform options task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Add more platform options	Analyzed trends	Help	Add more platform options task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Add more platform options	Competitive other security aspects	Hurt	Add more platform options task can hurt competitive other security aspects softgoal since every new platform supported by the product can have it's own set of security issues and vulnerabilities.
Microsoft SQL	Add more platform options	Competitive other performance aspects	Hurt	Add more platform options task can hurt competitive other performance aspects softgoal due to the fact that the increased interoperability can lead to the lack of proper optimization for each platform.
Microsoft SQL	Add more platform options	Compatible with Linux	Help	Add more platform options task can help compatible with Linux softgoal by giving more options what platform to use, some of those platform can support Linux better than the others.
Microsoft SQL	Add more platform options	A lot of container options	Help	Add more platform options task can help a lot of container options softgoal by giving more options what platform to use, some of those platforms can work with a given container type better than the others.
Microsoft SQL	Add more platform options	Competitive simplicity	Hurt	Add more platform options task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Enable high availability configuration for SQL Server running in containers	Analyzed products	Help	Enable high availability configuration for SQL server running in containers task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Enable high availability configuration for SQL Server running in containers	Analyzed trends	Help	Enable high availability configuration for SQL server running in containers task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Enable high availability configuration for SQL Server running in containers	Failover cluster support is implemented	Help	Enable high availability configuration for SQL server running in containers task can help failover cluster support is implemented softgoal by increasing the stability of the failover cluster.
Microsoft SQL	Enable high availability configuration for SQL Server running in containers	Competitive other performance aspects	Hurt	Enable high availability configuration for SQL server running in containers task can hurt competitive other performance aspects softgoal due to the fact that high availability configuration can have not as high performance compared to the normal configuration.
Microsoft SQL	Enable high availability configuration for SQL Server running in containers	Competitive simplicity	Hurt	Enable high availability configuration for SQL server running in containers task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Implement support of up to five synchronous replica pairs	Analyzed products	Help	Implement support of up to five synchronous replica pairs task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Implement support of up to five synchronous replica pairs	Analyzed trends	Help	Implement support of up to five synchronous replica pairs task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Implement support of up to five synchronous replica pairs	Failover cluster support is implemented	Help	Implement support of up to five synchronous replica pairs task can help failover cluster support is implemented softgoal by increasing the efficiency and reliability of the failover system.
Microsoft SQL	Implement support of up to five synchronous replica pairs	Competitive other security aspects	Hurt	Implement support of up to five synchronous replica pairs task can hurt competitive other security aspects softgoal due to the fact that the replica pairs would have to adhere to the same security standards as the main database. Furthermore, those replicas would have to be hosted with the same security precautions as the main database.
Microsoft SQL	Implement support of up to five synchronous replica pairs	Competitive other performance aspects	Hurt	Implement support of up to five synchronous replica pairs task can hurt competitive other performance aspects softgoal by making the system keep the replica systems synced with the main database, which can lead to additional computational demands.
Microsoft SQL	Implement support of up to five synchronous replica pairs	Competitive other availability aspects	Help	Implement support of up to five synchronous replica pairs task can help competitive other availability aspects softgoal by having a failover system that can take over the moment main system goes down.
Microsoft SQL	Implement support of up to five synchronous replica pairs	Competitive simplicity	Hurt	Implement support of up to five synchronous replica pairs task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Implement a better scale-out with automatic redirection of connection based on read/write intent	Analyzed products	Help	Implement a better scale-out with automatic redirection of connection based on read/write intent task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Implement a better scale-out with automatic redirection of connection based on read/write intent	Analyzed trends	Help	Implement a better scale-out with automatic redirection of connection based on read/write intent task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Implement a better scale-out with automatic redirection of connection based on read/write intent	Competitive other security aspects	Hurt	Implement a better scale-out with automatic redirection of connection based on read/write intent task can hurt competitive other security aspects softgoal due to the fact that the replica databases can not be set up as secure as the primary database.
Microsoft SQL	Implement a better scale-out with automatic redirection of connection based on read/write intent	Competitive other performance aspects	Hurt	Implement a better scale-out with automatic redirection of connection based on read/write intent task can hurt competitive other performance aspects softgoal due to the fact that the system would have to maintain additional replica databases, which means more read/write operations performed on the databases.
Microsoft SQL	Implement a better scale-out with automatic redirection of connection based on read/write intent	Support of a large number of synchronous replica pairs	Help	Implement a better scale-out with automatic redirection of connection based on read/write intent task can help support of a large number of synchronous replica pairs softgoal by automating some operations with the replica databases.
Microsoft SQL	Implement a better scale-out with automatic redirection of connection based on read/write intent	Competitive other availability aspects	Help	Implement a better scale-out with automatic redirection of connection based on read/write intent task can help competitive other availability aspects softgoal by improving the replica database management.
Microsoft SQL	Implement a better scale-out with automatic redirection of connection based on read/write intent	Competitive simplicity	Hurt	Implement a better scale-out with automatic redirection of connection based on read/write intent task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Support high availability with remote storage on Kubernetes	Analyzed products	Help	Support high availability with remote storage on Kubernetes task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Support high availability with remote storage on Kubernetes	Analyzed trends	Help	Support high availability with remote storage on Kubernetes task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Support high availability with remote storage on Kubernetes	Competitive other security aspects	Hurt	Support high availability with remote storage on Kubernetes task can hurt competitive other security aspects softgoal due to the fact that the remote storage would have to be as secure as the main storage. Furthermore, communication between the local and a remote storage is a subject to vulnerabilities.
Microsoft SQL	Support high availability with remote storage on Kubernetes	Competitive other performance aspects	Hurt	Support high availability with remote storage on Kubernetes task can hurt competitive other performance aspects softgoal due to the fact that the remote storage would have to be in sync with the local storage, that would introduce additional read/write operations for the system, as well as other computational tasks.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Support high availability with remote storage on Kubernetes	Competitive simplicity	Hurt	Support high availability with remote storage on Kubernetes task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Other availability aspects be improved	Improve Analyzed products	Help	Other availability aspects be improved task can help improve analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Other availability aspects be improved	Analyzed trends	Help	Other availability aspects be improved task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Other availability aspects be improved	Competitive other security aspects	Hurt	Other availability aspects be improved task can hurt competitive other security aspects softgoal due to the fact that some design decisions aimed to improve the availability of the product can hurt its security, e.g. the creation of replica databases, where instead of one database a set of master-slave databases would have to be secured.
Microsoft SQL	Other availability aspects be improved	Competitive simplicity	Hurt	Other availability aspects be improved task can hurt competitive simplicity softgoal due to the fact that a new software attribute would make the overall design and architecture of the product more complicated.
Microsoft SQL	Improve simplicity	Analyzed products	Help	Improve simplicity task can help analyzed products softgoal by providing information regarding how well the development of the software went in the context of the whole product, as well as other properties of the software attribute, such as performance, usefulness, etc.
Microsoft SQL	Improve simplicity	Analyzed trends	Help	Improve simplicity task can help analyzed trends softgoal by providing information regarding how well the development of the software attribute went and how well the newly developed software attribute performs.
Microsoft SQL	Improve simplicity	Competitive other security aspects	Hurt	Improve simplicity task can hurt competitive other security aspects softgoal due to the fact that some design decisions can mean leaving out some software attributes of the product. Some of those software attributes can be aimed to improve the security of the product.
Microsoft SQL	Improve simplicity	Competitive other performance aspects	Hurt	Improve simplicity task can hurt competitive other performance aspects softgoal due to the fact that some design decisions that aim to make a system more simple can leave out some software attributes that aim to improve the performance of the system.
Microsoft SQL	Improve simplicity	Compatible with Linux	Hurt	Improve simplicity task can hurt compatible with Linux softgoal because increasing the interoperability of the system usually makes the product more complex.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Improve simplicity	A lot of container options	Hurt	Improve simplicity task can hurt a lot of container options softgoal because increasing the interoperability of the system usually makes the product more complex.
Microsoft SQL	Improve simplicity	A lot of language options	Hurt	Improve simplicity task can hurt a lot of language options softgoal because increasing the interoperability of the system usually makes the product more complex.
Microsoft SQL	Improve simplicity	A lot of platform options	Hurt	Improve simplicity task can hurt a lot of platform options softgoal because increasing the interoperability of the system usually makes the product more complex.
Microsoft SQL	Improve simplicity	Competitive other availability aspects	Hurt	Improve simplicity task can hurt competitive other availability aspects softgoal due to the fact that design decisions aimed to increase the simplicity of the product can leave out the software attributes of the product that aim to increase its availability.
Microsoft SQL	Improve core asset roadmapping	Machine learning on Linux is implemented	Help	Improve core asset roadmapping task can help machine learning on Linux is implemented softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core asset roadmapping	Input data partitioning is implemented	Help	Improve core asset roadmapping task can help input data partitioning is implemented softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core asset roadmapping	Failover cluster support is implemented	Help	Improve core asset roadmapping task can help failover cluster support is implemented softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core asset roadmapping	Java language extension is implemented	Help	Improve core asset roadmapping task can help Java language extension is implemented softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core asset roadmapping	ETL is supported	Help	Improve core asset roadmapping task can help ETL is supported softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core asset roadmapping	Data virtualization is supported	Help	Improve core asset roadmapping task can help data virtualization is supported softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core asset roadmapping	SQL data discovery and classification is supported	Help	Improve core asset roadmapping task can help SQL data discovery and classification is supported softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core asset roadmapping	Always encrypted with Secure Enclaves is supported	Help	Improve core asset roadmapping task can help always encrypted with secure enclaves is supported softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Improve core roadmapping	asset Vulnerability assessment is supported	Help	Improve core asset roadmapping task can help vulnerability assessment is supported softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core roadmapping	asset Certificate management functionality in SQL Server configuration manager is supported	Help	Improve core asset roadmapping task can help certificate management functionality in SQL server configuration manager is supported softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core roadmapping	asset Competitive other security aspects	Help	Improve core asset roadmapping task can help competitive other security aspects softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core roadmapping	asset Persistent Memory devices are supported	Help	Improve core asset roadmapping task can help persistent memory devices are supported softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core roadmapping	asset High performance of columnstore indexes	Help	Improve core asset roadmapping task can help high performance of columnstore indexes softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core roadmapping	asset Competitive other performance aspects	Help	Improve core asset roadmapping task can help competitive other performance aspects softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core roadmapping	asset Compatible with Linux	Help	Improve core asset roadmapping task can help compatible with Linux softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core roadmapping	asset A lot of container options	Help	Improve core asset roadmapping task can help a lot of container options softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core roadmapping	asset A lot of language options	Help	Improve core asset roadmapping task can help a lot of language options softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core roadmapping	asset A lot of platform options	Help	Improve core asset roadmapping task can help a lot of platform options softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core roadmapping	asset High availability configuration for SQL Server running in containers	Help	Improve core asset roadmapping task can help high availability configuration for SQL server running in containers softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core roadmapping	asset Support of a large number of synchronous replica pairs	Help	Improve core asset roadmapping task can help support of a large number of synchronous replica pairs softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft SQL	Improve core asset roadmapping	Efficient scale-out with automatic redirection of connection based on read/write intent	Help	Improve core asset roadmapping task can help efficient scale-out with automatic redirection of connection based on read/write intent softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core asset roadmapping	High availability with remote storage on Kubernetes	Help	Improve core asset roadmapping task can help high availability with remote storage on Kubernetes softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core asset roadmapping	Competitive other availability aspects	Help	Improve core asset roadmapping task can help competitive other availability aspects softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft SQL	Improve core asset roadmapping	Competitive simplicity	Help	Improve core asset roadmapping task can help competitive simplicity softgoal by providing knowledge about the core assets of the company that can be reused for the new software asset.
Microsoft Azure	Improve core asset roadmapping	Competitive roadmap intelligence	Help	Improve core asset roadmapping task can help competitive roadmap intelligence softgoal by providing information about the assets the company has and how well they are developed, how well those assets perform.
Microsoft Azure	Improve core asset roadmapping	Competitive functional attributes	Help	Improve core asset roadmapping task can help competitive functional attributes softgoal by providing information regarding what core assets the company currently has and how those assets can be reused for the purpose of developing a new software feature.
Microsoft Azure	Improve core asset roadmapping	Competitive performance aspects	Help	Improve core asset roadmapping task can help competitive performance aspects softgoal by providing information regarding what core assets the company currently has and how those assets can be reused for the purpose of developing a new software feature.
Microsoft Azure	Improve core asset roadmapping	Competitive security aspects	Help	Improve core asset roadmapping task can help competitive security aspects softgoal by providing information regarding what core assets the company currently has and how those assets can be reused for the purpose of developing a new software feature.
Microsoft Azure	Improve core asset roadmapping	Competitive simplicity aspects	Help	Improve core asset roadmapping task can help competitive simplicity aspects softgoal by providing information regarding what core assets the company currently has and how those assets can be reused for the purpose of developing a new software feature.
Microsoft Azure	Improve roadmap intelligence	Competitive core asset roadmapping	Help	Improve roadmap intelligence task can help competitive core asset roadmapping softgoal by providing information regarding what technological trends, societal trends and other trends are the most promising in terms of win/loss so that the core assets of the company can be improved better.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft Azure	Improve roadmap intelligence	Competitive functional attributes	Help	Improve roadmap intelligence task can help competitive functional attributes softgoal by providing information regarding the most promising technological, societal and other trends so that the software attribute can be developed better and become more competitive.
Microsoft Azure	Improve roadmap intelligence	Competitive performance aspects	Help	Improve roadmap intelligence task can help competitive performance aspects softgoal by providing information regarding the most promising technological, societal and other trends so that the software attribute can be developed better and become more competitive.
Microsoft Azure	Improve roadmap intelligence	Competitive security aspects	Help	Improve roadmap intelligence task can help competitive security aspects softgoal by providing information regarding the most promising technological, societal and other trends so that the software attribute can be developed better and become more competitive.
Microsoft Azure	Improve roadmap intelligence	Competitive simplicity aspects	Help	Improve roadmap intelligence task can help competitive simplicity aspects softgoal by providing information regarding the most promising technological, societal and other trends so that the software attribute can be developed better and become more competitive.
Microsoft Azure	Performance aspects be improved	Competitive core asset roadmapping	Help	Performance aspects be improved task can help competitive core asset roadmapping softgoal by providing information about what assets were developed for the software attribute, how well those assets perform and if it is possible to make them the core assets for the future reuse.
Microsoft Azure	Performance aspects be improved	Competitive roadmap intelligence	Help	Performance aspects be improved task can help competitive roadmap intelligence softgoal by providing the knowledge about what assets were developed, how well those software assets perform and if it is possible to further improve those assets to meet the requirements of the trends described in the roadmap intelligence documents.
Microsoft Azure	Performance aspects be improved	Competitive security aspects	Hurt	Performance aspects be improved task can hurt competitive security aspects softgoal due to the fact that some design decisions aimed to improve the performance of the product often create security issues or create obstructions for the further improvement of the security of the product.
Microsoft Azure	Performance aspects be improved	Competitive simplicity aspects	Hurt	Performance aspects be improved task can hurt competitive simplicity aspects softgoal due to the fact that some design decisions aimed to improve the performance of the product make the product more complex.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft Azure	Security aspects be improved	Competitive core asset roadmapping	Help	Security aspects be improved task can help competitive core asset roadmapping softgoal by providing information about what assets were developed for the software attribute, how well those assets perform and if it is possible to make them the core assets for the future reuse.
Microsoft Azure	Security aspects be improved	Competitive roadmap intelligence	Help	Security aspects be improved task can help competitive roadmap intelligence softgoal by providing the knowledge about what assets were developed, how well those software assets perform and if it is possible to further improve those assets to meet the requirements of the trends described in the roadmap intelligence documents.
Microsoft Azure	Security aspects be improved	Competitive performance aspects	Hurt	Security aspects be improved task can hurt competitive performance aspects softgoal due to the fact that some design decisions aimed to improve the security of the product can hinder it's performance, e.g. encryption of the data can improve the security of the system, but decrease the performance of the system at the same time due to the fact that the data would have to be encrypted and decrypted.
Microsoft Azure	Security aspects be improved	Competitive simplicity aspects	Hurt	Security aspects be improved task can hurt competitive simplicity aspects softgoal due to the fact that some security design decisions can decrease the simplicity of the system, e.g. implementing encryption of the data can improve the security of the system and decrease the simplicity of the system due to the fact that additional software attributes would have to be implemented to create a workflow for the encrypted data.
Microsoft Azure	Simplicity aspects be improved	Competitive core asset roadmapping	Help	Simplicity aspects be improved task can help competitive core asset roadmapping softgoal by providing information about what assets were developed for the software attribute, how well those assets perform and if it is possible to make them the core assets for the future reuse.
Microsoft Azure	Simplicity aspects be improved	Competitive roadmap intelligence	Help	Simplicity aspects be improved task can help competitive roadmap intelligence softgoal by providing the knowledge about what assets were developed, how well those software assets perform and if it is possible to further improve those assets to meet the requirements of the trends described in the roadmap intelligence documents.
Microsoft Azure	Simplicity aspects be improved	Competitive performance aspects	Hurt	Simplicity aspects be improved task can hurt competitive performance aspects softgoal due to the fact that in order to make a system more simple sometimes software attributes of the system are left out, e.g. some performance aspects that aim to give the system more computational capacity.

Table 9: Continued

Actor	Contributor	Recipient	Type	Explanation
Microsoft Azure	Simplicity aspects be improved	Competitive security aspects	Hurt	Simplicity aspects be improved task can hurt competitive security aspects softgoal due to the fact that making a system more simple can mean leaving out some software attributes of the system, e.g. some security aspects of the system such as encryption system.
Microsoft Azure	Implement "Bring your own license" policy	Flexible pricing model be present	Help	Implement "bring your own license" policy task can help flexible pricing model be present softgoal by giving a customer a discount in the amount the customer already paid for the purchased license.

C Dependencies between actors

Table 10: Dependencies between the actors.
 Large Enterprise IT Department is shortened to LE IT DP.
 Large Enterprise is shortened to LE.

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation
LE	IT infrastructure be competitive	LE IT Department	Best DB service be provided	Receive competitive IT infrastructure	Task	IT department supplies LE with the competitive IT infrastructure, including database service.
LE IT DP	Use best DB service	Amazon	Sell product as is	Buy Microsoft SQL from Amazon	Task	Purchase of Microsoft SQL server, only the software product, without the service.
LE IT DP	Use best DB service	Amazon	Offer DBaaS	Buy Microsoft SQL on Amazon RDS	Task	Purchase the Amazon RDS service with Microsoft SQL on it.
LE IT DP	Use best DB service	Amazon	Offer IAAS	Buy Amazon Virtual Machine	Task	Purchase Amazon Virtual Machine. The purchase, setup and management of the SQL server lies on the IT department.
LE IT DP	Use best DB service	Amazon	Sell directly competitive product	Buy DBaaS from Amazon	Task	Purchase DBaaS from Amazon that is not based on any of Microsoft's products.
LE IT DP	Use best DB service	Amazon	Sell complimentary product	Buy complimentary product from Amazon	Task	Purchase a complimentary product from Amazon for the DBaaS.
Amazon	Sell available products	LE IT DP	Use best DB service	Sell available products to customers	Task	Sell any products available for the company to the customers.
Amazon	Analyze customer win/loss	LE IT DP	Use best DB service	Gather knowledge about customer win/loss	Task	Analyze the customer with the goal to gather information what would be the win/loss of the customer if it uses company's product.
Amazon	Analyze business case	LE IT DP	Use best DB service	Gather knowledge about customer business case	Task	Analyze the customer with the goal to gather information what the business case for using the product is with the intention to use this information for the development of the product.
SME	Use database service that fits best	Amazon	Sell product as is	Buy Microsoft SQL from Amazon	Task	Purchase of Microsoft SQL server, only the software product, without the service.

Table 10: Continued

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation
SME	Use database service that fits best	Amazon	Offer DBaaS	Buy Microsoft SQL on Amazon RDS	Task	Purchase the Amazon RDS service with Microsoft SQL on it.
SME	Use database service that fits best	Amazon	Offer IAAS	Buy Amazon Virtual Machine	Task	Purchase Amazon Virtual Machine. The purchase, setup and management of the SQL server lies on the IT department.
SME	Use database service that fits best	Amazon	Sell directly competitive product	Buy DBaaS from Amazon	Task	Purchase DBaaS from Amazon that is not based on any of Microsoft's products.
SME	Use database service that fits best	Amazon	Sell complimentary product	Buy complimentary product from Amazon	Task	Purchase a complimentary product from Amazon for the DBaaS.
Amazon	Sell available products	SME	Use database service that fits best	Sell available products to customers	Task	Sell any products available for the company to the customers.
Amazon	Analyze customer win/loss	SME	Use database service that fits best	Gather knowledge about customer win/loss	Task	Analyze the customer with the goal to gather information what would be the win/loss of the customer if it uses company's product.
Amazon	Analyze business case	SME	Use database service that fits best	Gather knowledge about customer business case	Task	Analyze the customer with the goal to gather information what the business case for using the product is with the intention to use this information for the development of the product.
LE Dept	IT Use best DB service	Microsoft	Sell product as is	Buy Microsoft SQL from Microsoft	Task	Purchase of Microsoft SQL server, only the software product, without the service.
LE Dept	IT Use best DB service	Microsoft	Offer DBaaS	Buy Microsoft SQL on Microsoft Azure	Task	Purchase the Microsoft Azure service with Microsoft SQL on it.
LE Dept	IT Use best DB service	Microsoft	Offer IAAS	Buy Virtual Machine on Microsoft Azure	Task	Purchase Virtual Machine on Microsoft Azure. The purchase, setup and management of the SQL server lies on the IT department.
LE Dept	IT Use best DB service	Microsoft	Sell directly competitive product	Buy DBaaS from Microsoft	Task	Purchase DBaaS from Microsoft that is not based on any of Amazon's products.
LE Dept	IT Use best DB service	Microsoft	Sell complimentary product	Buy complimentary product from Microsoft	Task	Purchase a complimentary product from Microsoft for the DBaaS.
Microsoft	Sell available products	LE IT DP	Use best DB service	Sell available products to customers	Task	Sell any products available for the company to the customers.
Microsoft	Analyze customer win/loss	LE IT DP	Best fitting database service be used	Gather knowledge about customer win/loss	Task	Analyze the customer with the goal to gather information what would be the win/loss of the customer if it uses company's product.
Microsoft	Analyze business case	LE IT DP	Use database service that fits best	Gather knowledge about customer business case	Task	Analyze the customer with the goal to gather information what the business case for using the product is with the intention to use this information for the development of the product.
SME	Use database service that fits best	Microsoft	Sell product as is	Buy Microsoft SQL from Microsoft	Task	Purchase of Microsoft SQL server, only the software product, without the service.
SME	Use database service that fits best	Microsoft	Offer DBaaS	Buy Microsoft SQL on Microsoft Azure	Task	Purchase the Microsoft Azure service with Microsoft SQL on it.

Table 10: Continued

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation
SME	Use database service that fits best	Microsoft	Offer IAAS	Buy Virtual Machine on Microsoft Azure	Task	Purchase Virtual Machine on Microsoft Azure. The purchase, setup and management of the SQL server lies on the IT department.
SME	Use database service that fits best	Microsoft	Sell directly competitive product	Buy DBaaS from Microsoft	Task	Purchase DBaaS from Microsoft that is not based on any of Amazon's products.
SME	Use database service that fits best	Microsoft	Sell complimentary product	Buy complimentary product from Microsoft	Task	Purchase a complimentary product from Microsoft for the DBaaS.
Microsoft	Sell available products	SME	Use database service that fits best	Sell available products to customers	Task	Sell any products available for the company to the customers.
Microsoft	Analyze customer win/loss	SME	Use database service that fits best	Gather knowledge about customer win/loss	Task	Analyze the customer with the goal to gather information what would be the win/loss of the customer if it uses company's product.
Microsoft	Analyze business case	SME	Use database service that fits best	Gather knowledge about customer business case	Task	Analyze the customer with the goal to gather information what the business case for using the product is with the intention to use this information for the development of the product.
Amazon	Identify market trends	Microsoft	Actor	Analyze Microsoft from a market trends perspective	Task	Perform an analysis of another company on the market to obtain more knowledge about the current market trends.
Amazon	Sell complimentary product	Microsoft	Sell complimentary product	Obtain requirements for the complimentary product	Task	Perform an analysis of another company's product with a goal to obtain the requirements for the complimentary product. Those requirements are both technical ones and the business ones, e.g. contracting work, creation of formal agreements between the companies.
Amazon	Offer IAAS	Microsoft	Sell complimentary product	Acquire DB for the "IAAS + DB" bundle	Task	Perform the work related to the creation of the "IAAS + DB" bundle of products that is to be sold to the end customer. This dependum includes both technical work, e.g. managing the technical requirements for the two products to work together and the contracting work, e.g. managing agreements between the companies regarding how the products of the two companies can be used by the other party.
Amazon	Offer DBaaS	Microsoft	Sell complimentary product	Acquire DB for the "DBaaS + DB" bundle	Task	Perform the work related to the creation of the "DBaaS + DB" bundle of products that is to be sold to the end customer. This dependum includes both technical work, e.g. managing the technical requirements for the two products to work together and the contracting work, e.g. managing agreements between the companies regarding how the products of the two companies can be used by the other party.
Amazon	Sell product as is	Microsoft	Sell available products	Obtain a product to resell	Task	Obtain a product from another company that is to be resold by the company.

Table 10: Continued

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation
Amazon	Establish and evaluate pricing model	Microsoft	Actor	Analyze the pricing model of another company	Task	Analyze the pricing model of another company.
Amazon	Investigate distribution channels	Microsoft	Actor	Analyze if products can be sold via another company	Task	Analyze if own products can be sold via another company. The analysis includes whether such sales are profitable, how difficult it is to setup another company as a distribution partner, etc.
Amazon	Manage intellectual property	Microsoft	Actor	Manage partner's property	Task	Manage partner's intellectual property that the company has access to.
Amazon	Make acquisition	Microsoft	Actor	Purchase other company's assets	Task	Purchase some assets of the other company. Such assets can include, but not limited to: patents, software assets, etc.
Amazon	One sided short term collaboration	Microsoft	Long term collaboration	Make collaboration agreement that meets short term goals	Task	Engage in the short term collaboration activity, pretending this collaboration to be long term, in the pursuit of the short term goals, such as stealing technology, gaining more insights into the other company, etc.
Amazon	Long term collaboration	Microsoft	Long term collaboration	Make collaboration that meets long-term goals	Task	Engage in a long term collaboration with a goal to improve own product.
Amazon	Analyze competitors	Microsoft	Actor	Analyze Microsoft as a competitor	Task	Analyze Microsoft from the perspective of a competitor.
Amazon	Make a market strategy	Microsoft	Actor	Include the role of Microsoft into the market strategy	Task	Analyze and include Microsoft into the Amazon's market strategy.
Microsoft	Sell complimentary product	Amazon	Sell complimentary product	Obtain requirements for the complimentary product	Task	Perform an analysis of another company's product with a goal to obtain the requirements for the complimentary product. Those requirements are both technical ones and the business ones, e.g. contracting work, creation of formal agreements between the companies.
Microsoft	Offer IAAS	Amazon	Sell complimentary product	Acquire DB for the "IAAS + DB" bundle	Task	Perform the work related to the creation of the "IAAS + DB" bundle of products that is to be sold to the end customer. This dependum includes both technical work, e.g. managing the technical requirements for the two products to work together and the contracting work, e.g. managing agreements between the companies regarding how the products of the two companies can be used by the other party.

Table 10: Continued

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation
Microsoft	Offer DBaaS	Amazon	Sell complimentary product	Acquire DB for the "DBaaS + DB" bundle	Task	Perform the work related to the creation of the "DBaaS + DB" bundle of products that is to be sold to the end customer. This dependum includes both technical work, e.g. managing the technical requirements for the two products to work together and the contracting work, e.g. managing agreements between the companies regarding how the products of the two companies can be used by the other party.
Microsoft	Sell product as is	Amazon	Sell available products	Obtain a product to resell	Task	Obtain a product from another company that is to be resold by the company.
Microsoft	Establish and evaluate pricing model	Amazon	Actor	Analyze the pricing model of another company	Task	Analyze the pricing model of another company.
Microsoft	Investigate distribution channels	Amazon	Actor	Analyze if products can be sold via another company	Task	Analyze if own products can be sold via another company. The analysis includes whether such sales are profitable, how difficult it is to setup another company as a distribution partner, etc.
Microsoft	Manage intellectual property	Amazon	Actor	Manage partner's property	Task	Manage partner's intellectual property that the company has access to.
Microsoft	Make acquisition	Amazon	Actor	Purchase other company's assets	Task	Purchase some assets of the other company. Such assets can include, but not limited to: patents, software assets, etc.
Microsoft	One sided short term collaboration	Amazon	Long term collaboration	Make collaboration agreement that meets short term goals	Task	Engage in the short term collaboration activity, pretending this collaboration to be long term, in the pursuit of the short term goals, such as stealing technology, gaining more insights into the other company, etc.
Microsoft	Long term collaboration	Amazon	Long term collaboration	Make collaboration that meets long-term goals	Task	Engage in a long term collaboration with a goal to improve own product.
Microsoft	Analyze competitors	Amazon	Actor	Analyze Amazon as a competitor	Task	Analyze Amazon from the perspective of a competitor.
Microsoft	Make a market strategy	Amazon	Actor	Include the role of Amazon into the market strategy	Task	Analyze and include Amazon into the Amazon's market strategy.
Microsoft	Identify market trends	Amazon	Actor	Analyze Amazon from a market trends perspective	Task	Perform an analysis of another company on the market to obtain more knowledge about the current market trends.
Amazon	Identify market trends	Amazon RDS	Improve the marketing strategy	Gather knowledge about market trends for DBaaS	Task	Gather knowledge about the market trends for DBaaS by analyzing Amazon RDS, both from the technical and economic standpoints.
Amazon	Make a market strategy	Amazon RDS	Improve the marketing strategy	Gather knowledge for market strategy	Task	Gather knowledge about Amazon RDS for the market strategy developed at Amazon.
Amazon	Analyze product life cycle	Amazon RDS	Analyze products	Analyze Amazon RDS life cycle	Task	Gather knowledge about Amazon RDS to more accurately describe it's life cycle.

Table 10: Continued

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation
Amazon	Decide on portfolio innovation	Amazon RDS	Analyze trends	Gather the knowledge about the product future innovations	Task	Gather the knowledge about the product about what innovations are the most apt for the product in the current market.
Amazon	Analyze portfolio scope	Amazon RDS	Improve core asset roadmapping	Analyze the product as a part of portfolio	Task	Analyze the product from the perspective of it being a part of the product portfolio that the company owns. The dependency on the "Improve product roadmapping" is explained by the fact that the direction in which the product is developed, as well as how fast this development process is done determines the place of the product in the company portfolio.
Amazon	Product development	Amazon RDS	Improve product roadmapping	Make the product more competitive on the market	Task	Continue the development of the product to make the next iteration of the product more competitive on the market.
Amazon	Long term collaboration	Amazon RDS	Improve core asset roadmapping	Collect knowledge for long term collaboration areas	Task	Collect knowledge of the product regarding what areas of the product can be worked on in collaboration with a partner company.
Amazon	One sided short term collaboration	Amazon RDS	Improve core asset roadmapping	Collect knowledge for short term collaboration areas	Task	Collect knowledge for the areas that can be improved by entering a one sided short term collaboration with another company.
Amazon	Make acquisition	Amazon RDS	Improve product roadmapping	Collect knowledge about what assets can be acquired for the product	Task	Collect knowledge for the areas that can be improved by making an acquisition of assets owned by other companies.
Amazon	Make acquisition	Amazon RDS	Improve core asset roadmapping	Collect knowledge about what assets can be acquired for the core assets	Task	Collect knowledge for the areas of the core assets that can be improved by making an acquisition of assets owned by other companies.
Amazon	Establish and evaluate pricing model	Amazon RDS	Improve the marketing strategy	Gather knowledge about the product relevant to the pricing model of the product within the company	Task	Gather the knowledge of the product that is relevant to the creation of the pricing model of the product within company. Such knowledge can include, but not limited to, product development costs, product maintenance costs, etc.
Amazon RDS	Analyze products	Amazon	Analyze business case	Analyze products in the context of the business case	Task	Having the context in the form of business case in which the product would be used in can help product analysis, e.g. by evaluating how well the product solves the problems posed by the business case.
Amazon RDS	Implement integration with machine learning tools	Amazon	Develop product lines	Get resources for development of integration with machine learning tools	Task	Get resources allocated by Amazon for the development of the given feature.
Amazon RDS	Implement monitoring function	Amazon	Develop product lines	Get resources for development of monitoring functions	Task	Get resources allocated by Amazon for the development of the given feature.
Amazon RDS	Support failover	Amazon	Develop product lines	Get resources for development of failover support	Task	Get resources allocated by Amazon for the development of the given feature.

Table 10: Continued

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation
Amazon RDS	Support replication	Amazon	Develop lines	product	Get resources for development of replication support	Task Get resources allocated by Amazon for the development of the given feature.
Amazon RDS	Support backup and restore	Amazon	Develop lines	product	Get resources for development of backup and restore support	Task Get resources allocated by Amazon for the development of the given feature.
Amazon RDS	Implement identity and access management	Amazon	Develop lines	product	Get resources for development of identity and access management	Task Get resources allocated by Amazon for the development of the given feature.
Amazon RDS	Implement data protection	Amazon	Develop lines	product	Get resources for development of data protection	Task Get resources allocated by Amazon for the development of the given feature.
Amazon RDS	Support SQL	Microsoft	Develop lines	product	Get resources for development of Microsoft SQL support	Task Get resources allocated by Amazon for the development of the given feature.
Amazon RDS	Support MySQL, MariaDB, PostgreSQL, Oracle	Amazon	Develop lines	product	Get resources for development of MySQL, MariaDB, PostgreSQL, Oracle support	Task Get resources allocated by Amazon for the development of the given feature.
Amazon RDS	Support Aurora	Amazon	Develop lines	product	Get resources for development of Amazon Aurora	Task Get resources allocated by Amazon for the development of the given feature.
Amazon RDS	Improve efficiency	Amazon	Develop lines	product	Get resources for development of improved efficiency	Task Get resources allocated by Amazon for the development of the given feature.
Amazon RDS	Improve simplicity	Amazon	Develop lines	product	Get resources for development of improved simplicity	Task Get resources allocated by Amazon for the development of the given feature.
Amazon RDS	Implement free trials policy	Amazon	Make a market strategy		Get approval of the "implement free trials" marketing tactic by the company	Task Get a formal approval from the company of the marketing tactic performed by the product team.
Amazon RDS	Implement flexible pricing model	Amazon	Make a market strategy		Get approval of the "implement flexible pricing model" marketing tactic by the company	Task Get a formal approval from the company of the marketing tactic performed by the product team.
Amazon RDS	Implement "Bring your own license" policy	Amazon	make a market strategy		Get approval of the "implement "bring your own license" policy" marketing tactic by the company	Task Get a formal approval from the company of the marketing tactic performed by the product team.
Microsoft	Identify trends	market	Azure	Improve the marketing strategy	Gather knowledge about market trends for DBaaS	Task Gather knowledge about the market trends for DBaaS by analyzing Azure, both from the technical and economic standpoints.
Microsoft	Make a market strategy	Azure	Improve the marketing strategy		Gather knowledge for market strategy	Task Gather knowledge about Azure for the market strategy developed at Microsoft.

Table 10: Continued

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation
Microsoft	Analyze product life cycle	Azure	Improve roadmap intelligence	Analyze Azure life cycle	Task	Gather knowledge about Azure to more accurately describe it's life cycle.
Microsoft	Decide on portfolio innovation	Azure	Improve roadmap intelligence	Gather the knowledge about the product future innovations	Task	Gather the knowledge about the product about what innovations are the most apt for the product in the current market.
Microsoft	Analyze portfolio scope	Azure	Improve core asset roadmapping	Analyze the product as a part of portfolio	Task	Analyze the product from the perspective of it being a part of the product portfolio that the company owns. The dependency on the "Improve product roadmapping" is explained by the fact that the direction in which the product is developed, as well as how fast this development process is done determines the place of the product in the company portfolio.
Microsoft	Product development	Azure	Improve product roadmapping	Make the product more competitive on the market	Task	Continue the development of the product to make the next iteration of the product more competitive on the market.
Microsoft	Long term collaboration	Azure	Improve core asset roadmapping	Collect knowledge for long term collaboration areas	Task	Collect knowledge of the product regarding what areas of the product can be worked on in collaboration with a partner company.
Microsoft	One sided short term collaboration	Azure	Improve core asset roadmapping	Collect knowledge for short term collaboration areas	Task	Collect knowledge for the areas that can be improved by entering a one sided short term collaboration with another company.
Microsoft	Make acquisition	Azure	Improve product roadmapping	Collect knowledge about what assets can be acquired for the product	Task	Collect knowledge for the areas that can be improved by making an acquisition of assets owned by other companies.
Microsoft	Make acquisition	Azure	Improve core asset roadmapping	Collect knowledge about what assets can be acquired for the core assets	Task	Collect knowledge for the areas of the core assets that can be improved by making an acquisition of assets owned by other companies.
Microsoft	Establish and evaluate pricing model	Azure	Improve the marketing strategy	Gather knowledge about the product relevant to the pricing model of the product within the company	Task	Gather the knowledge of the product that is relevant to the creation of the pricing model of the product within company. Such knowledge can include, but not limited to, product development costs, product maintenance costs, etc.
Azure	Improve roadmap intelligence	Microsoft	Analyze business case	Analyze products in the context of the business case	Task	Having the context in the form of business case in which the product would be used in can help product analysis, e.g. by evaluating how well the product solves the problems posed by the business case.
Azure	Improve functional attributes	Microsoft	Develop product lines	Get resources for development of functional attributes	Task	Get resources allocated by Microsoft for the development of the functional attributes.
Azure	Performance aspects be improved	Microsoft	Develop product lines	Get resources for development of performance aspects	Task	Get resources allocated by Microsoft for the development of the given feature.

Table 10: Continued

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation
Azure	Security aspects be improved	Microsoft	Develop product lines	Get resources for development of security aspects	Task	Get resources allocated by Microsoft for the development of the given feature.
Azure	Simplicity aspects be improved	Microsoft	Develop product lines	Get resources for development of simplicity aspects	Task	Get resources allocated by Microsoft for the development of the given feature.
Azure	Implement free trials policy	Microsoft	Make a market strategy	Get approval of the "implement free trials" marketing tactic by the company	Task	Get a formal approval from the company of the marketing tactic performed by the product team.
Azure	Implement flexible pricing model	Microsoft	Make a market strategy	Get approval of the "implement flexible pricing model" marketing tactic by the company	Task	Get a formal approval from the company of the marketing tactic performed by the product team.
Azure	Implement "Bring your own license" policy	Microsoft	Make a market strategy	Get approval of the "implement "bring your own license" policy" marketing tactic by the company	Task	Get a formal approval from the company of the marketing tactic performed by the product team.
Microsoft	Analyze product life cycle	MCR SQL	Analyze products	Analyze MCR SQL life cycle	Task	Gather knowledge about MCR SQL to more accurately describe it's life cycle.
Microsoft	Decide on portfolio innovation	MCR SQL	Analyze trends	Gather the knowledge about the product future innovations	Task	Gather the knowledge about the product about what innovations are the most apt for the product in the current market.
Microsoft	Analyze portfolio scope	MCR SQL	Improve core asset roadmapping	Analyze the product as a part of portfolio	Task	Analyze the product from the perspective of it being a part of the product portfolio that the company owns. The dependency on the "Improve product roadmapping" is explained by the fact that the direction in which the product is developed, as well as how fast this development process is done determines the place of the product in the company portfolio.
Microsoft	Product development	MCR SQL	Improve product roadmapping	Make the product more competitive on the market	Task	Continue the development of the product to make the next iteration of the product more competitive on the market.
Microsoft	Long term collaboration	MCR SQL	Improve core asset roadmapping	Collect knowledge for long term collaboration areas	Task	Collect knowledge of the product regarding what areas of the product can be worked on in collaboration with a partner company.
Microsoft	One sided short term collaboration	MCR SQL	Improve core asset roadmapping	Collect knowledge for short term collaboration areas	Task	Collect knowledge for the areas that can be improved by entering a one sided short term collaboration with another company.
Microsoft	Make acquisition	MCR SQL	Improve product roadmapping	Collect knowledge about what assets can be acquired for the product	Task	Collect knowledge for the areas that can be improved by making an acquisition of assets owned by other companies.

Table 10: Continued

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation
Microsoft	Make acquisition	MCR SQL	Improve core asset roadmapping	Collect knowledge about what assets can be acquired for the core assets	Task	Collect knowledge for the areas of the core assets that can be improved by making an acquisition of assets owned by other companies.
MCR SQL	Analyze products	Microsoft	Analyze business case	Analyze products in the context of the business case	Task	Having the context in the form of business case in which the product would be used in can help product analysis, e.g. by evaluating how well the product solves the problems posed by the business case.
MCR SQL	Implement machine learning on Linux	Microsoft	Develop lines product	Get resources for development of machine learning on Linux implementation	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Implement input data partitioning	Microsoft	Develop lines product	Get resources for development of input data partitioning implementation	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Implement failover cluster support	Microsoft	Develop lines product	Get resources for development of failover cluster support implementation	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Implement Java language extension	Microsoft	Develop lines product	Get resources for development of Java language extension implementation	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Support ETL	Microsoft	Develop lines product	Get resources for development of ETL support	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Support data virtualization	Microsoft	Develop lines product	Get resources for development of data virtualization support	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Support SQL data discovery and classification	Microsoft	Develop lines product	Get resources for development of SQL data discovery and classification support	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Support always encrypted with Secure Enclaves	Microsoft	Develop lines product	Get resources for development of always encrypted with Secure Enclaves support	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Support vulnerability assessment	Microsoft	Develop lines product	Get resources for development of vulnerability assessment support	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Support Certificate management functionality in SQL Server configuration management	Microsoft	Develop lines product	Get resources for development of Certificate management functionality in SQL Server configuration manager support	Task	Get resources allocated by Microsoft for the development of the given feature.

Table 10: Continued

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation	
MCR SQL	Improve other security aspects	Microsoft	Develop lines	product	Get resources for development of other security aspects improvement	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Support Persistent Memory devices	Microsoft	Develop lines	product	Get resources for development of Persistent Memory devices support	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Improve performance of columnstore indexes	Microsoft	Develop lines	product	Get resources for development of performance of columnstore indexes improvement	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Improve other performance aspects	Microsoft	Develop lines	product	Get resources for development of other performance aspects improvement	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Add more container options	Microsoft	Develop lines	product	Get resources for development of more container options	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Add more language options	Microsoft	Develop lines	product	Get resources for development of more language options	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Add more platform options	Microsoft	Develop lines	product	Get resources for development of more platform options	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Enable high availability configuration for SQL Server running in containers	Microsoft	Develop lines	product	Get resources for development of high availability configuration for SQL Server running in containers	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Implement support of up to five synchronous replica pairs	Microsoft	Develop lines	product	Get resources for development of up to five synchronous replica pairs support implementation	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Implement a better scale-out with automatic redirection of connection based on read/write intent	Microsoft	Develop lines	product	Get resources for development of a better scale-out with automatic redirection of connection based on read/write intent implementation	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Support high availability with remote storage on Kubernetes	Microsoft	Develop lines	product	Get resources for development of high availability with remote storage on Kubernetes support	Task	Get resources allocated by Microsoft for the development of the given feature.
MCR SQL	Other availability aspects be improved	Microsoft	Develop lines	product	Get resources for development of improvement of other availability aspects	Task	Get resources allocated by Microsoft for the development of the given feature.

Table 10: Continued

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation
MCR SQL	Improve simplicity	Microsoft	Develop product lines	Get resources for development of simplicity improvement	Task	Get resources allocated by Microsoft for the development of the given feature.
Microsoft Azure	Improve core asset roadmapping	MCR SQL	Improve product roadmapping	Gather knowledge for DBaaS core asset roadmapping from the database roadmapping	Task	Having a better understanding of the database roadmap can improve the core asset roadmapping for the DBaaS, e.g. by developing the interface between the customer and the database for the new functionality introduced in the database.
Microsoft Azure	Improve roadmap intelligence	MCR SQL	Improve roadmap intelligence	Gather knowledge for DBaaS roadmap intelligence from the database roadmap intelligence	Task	Having a better understanding of the database roadmap intelligence can help reducing the service being outdated compared to the database it's based on.
Microsoft Azure	Improve functional attributes	MCR SQL	Improve functional attributes	Improve functional attributes based on the database functional attributes improvements	Task	Functional attributes of the service can be improved based on the functional attributes improvements of the database the service is based on.
Microsoft Azure	Performance aspects be improved	MCR SQL	Improve performance	Database performance be improved	Task	Quality attributes of the service are heavily influenced by the quality attributes of the database it is based on.
Microsoft Azure	Security aspects be improved	MCR SQL	Improve security	Database security be improved	Task	Quality attributes of the service are heavily influenced by the quality attributes of the database it is based on.
Microsoft Azure	Simplicity aspects be improved	MCR SQL	Improve simplicity	Database simplicity be improved	Task	Quality attributes of the service are heavily influenced by the quality attributes of the database it is based on.
Amazon RDS	Improve core asset roadmapping	MCR SQL	Improve product roadmapping	Gather knowledge for DBaaS core asset roadmapping from the database roadmapping	Task	Having a better understanding of the database roadmap can improve the core asset roadmapping for the DBaaS, e.g. by developing the interface between the customer and the database for the new functionality introduced in the database.
Amazon RDS	Improve roadmap intelligence	MCR SQL	Improve roadmap intelligence	Gather knowledge for DBaaS roadmap intelligence from the database roadmap intelligence	Task	Having a better understanding of the database roadmap intelligence can help reducing the service being outdated compared to the database it's based on.
Amazon RDS	Improve functional attributes	MCR SQL	Improve functional attributes	Improve functional attributes based on the database functional attributes improvements	Task	Functional attributes of the service can be improved based on the functional attributes improvements of the database the service is based on.
Amazon RDS	Support failover	MCR SQL	Implement failover cluster support	Database supports failover	Task	Functional and quality attributes present in the database can greatly improve the corresponding attributes of the DBaaS.
Amazon RDS	Support replication	MCR SQL	Implement support of up to five synchronous replica pairs	Database supports replication	Task	Functional and quality attributes present in the database can greatly improve the corresponding attributes of the DBaaS.

Table 10: Continued

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation
Amazon RDS	Support backup and restore	MCR SQL	Other availability aspects be improved	Database supports backups	Task	Functional and quality attributes present in the database can greatly improve the corresponding attributes of the DBaaS.
Amazon RDS	Implement advanced security	MCR SQL	Improve security	Database supports advanced security	Task	Functional and quality attributes present in the database can greatly improve the corresponding attributes of the DBaaS.
Amazon RDS	Improve interoperability	MCR SQL	Improve compatibility	Database supports interoperability	Task	Functional and quality attributes present in the database can greatly improve the corresponding attributes of the DBaaS.
Amazon RDS	Improve efficiency	MCR SQL	Improve performance	Database supports advanced efficiency	Task	Functional and quality attributes present in the database can greatly improve the corresponding attributes of the DBaaS.
Amazon RDS	Improve simplicity	MCR SQL	Improve simplicity	Database supports advanced simplicity	Task	Functional and quality attributes present in the database can greatly improve the corresponding attributes of the DBaaS.
SME	Save costs	Amazon RDS	Improve the marketing strategy	Database allows to save costs	Task	The marketing strategy of the DBaaS allows it's clients to save costs.
SME	Make easy to use	Amazon RDS	Improve simplicity	Database is easy to use	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
SME	Make reliable	Amazon RDS	Improve resilience	Database is reliable	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
SME	Make secure	Amazon RDS	Implement advanced security	Database is secure	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
SME	Improve sharing and collaboration	Amazon RDS	Improve efficiency	Database is efficient in collaboration and sharing aspects	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
LE IT DP	Improve security	Amazon RDS	Implement advanced security	Database supports advanced security	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
LE IT DP	Make DB service resilient	Amazon RDS	Improve resilience	Database is resilient	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
LE IT DP	Improve interoperability	Amazon RDS	Improve interoperability	Database supports interoperability	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
LE IT DP	Improve business process management	Amazon RDS	Improve efficiency	Database improves efficiency of the business processes	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
LE IT DP	Improve scalability	Amazon RDS	Improve simplicity	Database improves the scalability of the LE IT DP due to it's simplicity	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
SME	Save costs	Azure	Improve the marketing strategy	Database allows to save costs	Task	The marketing strategy of the DBaaS allows it's clients to save costs.
SME	Make easy to use	Azure	Simplicity aspects be improved	Database is easy to use	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.

Table 10: Continued

Depender	Depender Element	Dependee	Dependee element	Dependum	Dependum type	Explanation
SME	Make reliable	Azure	Security aspects be improved	Database is reliable	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
SME	Make secure	Azure	Security aspects be improved	Database is secure	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
SME	Improve sharing and collaboration	Azure	Performance aspects be improved	Database is efficient in collaboration and sharing aspects	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
LE IT DP	Improve security	Azure	Security aspects be improved	Database supports advanced security	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
LE IT DP	Make DB service resilient	Azure	Security aspects be improved	Database is resilient	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
LE IT DP	Improve interoperability	Azure	Simplicity aspects be improved	Database supports interoperability due to it's simplicity	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
LE IT DP	Improve business process management	Azure	Performance aspects be improved	Database improves efficiency of the business processes	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.
LE IT DP	Improve scalability	Azure	Simplicity aspects be improved	Database improves the scalability of the LE IT DP due to it's simplicity	Task	Functional and quality attributes present at the DBaaS meet the requirements of the end client.

D Modeling guidelines

D.1 i* modeling guidelines

Table 11: Guidelines for i* modeling.

Level is the estimated level of expertise required in order to follow the guideline correctly.

Type states what aspect of modeling the guideline refers to.

Number is the section in the source document [75] that explains the guideline.

Kind is the type of the contribution to the success of the modeling process if the guideline is followed.

Phase refers to the phase of the modeling process described in Figure 4.3.

Guideline	Level	Type	Number	Kind	Phase
Do not include an Actor within another Actor	Beginner	Concept	4.1.5	Negative	M1
Softgoal Dependency should not be met directly by a Goal.	Beginner	Concept	4.3.4.1	Negative	M7
Use the Dependency link to indicate a Strategic Dependency relationship between Actors.	Intermediate	Concept & Evaluation	4.3.6	Positive	M7
Use the “D” symbol notation to denote a Dependency Link.	Beginner	Notation	4.3.7	Positive	M7
Do not use Dependency Links inside an Actor.	Beginner	Concept	4.3.8	Negative	M7
Ensure that both sides of a Dependency Link point in the same direction.	Beginner	Concept	4.3.9	Positive	M7
Do not reuse Dependums in more than one Dependency Relation.	Intermediate	Concept & Evaluation	4.3.10	Negative	M7
Do not use a Dependency Link between two actors without showing the Dependum.	Beginner	Concept	4.3.11	Negative	M7
Avoid or minimize drawing intersecting Links and overlapping Links with other Links and elements’ text.	Beginner	Layout	4.3.12	Negative	M1-M7
Make both sides of a Dependency Link look like a single, continuous curve as it passes through the Dependum.	Beginner	Layout	4.3.13	Positive	M7
Spread the connection points of Dependency Links out on an Actor.	Beginner	Layout	4.3.14	Positive	M7
Keep elements horizontal and straight.	Beginner	Layout	4.3.15	Positive	M1-M7
Do not tilt or twist elements.	Beginner	Layout	4.3.15	Negative	M1-M7
Avoid or minimize overlapping boundaries of Actors where possible.	Beginner	Layout	5.1.1	Negative	M1,M2
Keep Dependency Links outside the boundaries of Actors.	Beginner	Layout	5.1.2	Positive	M7
Use the conventional Actors’ boundaries (circles) unless other shapes can improve the overall layout.	Beginner	Layout	5.1.3	Positive	M1
Use a Softgoal for quality criterion and use a (hard) goal for a sharply defined objective.	Beginner	Concept	5.2.1.1	Positive	M3,M5
Do not confuse Softgoal with optional, less important Goals.	Beginner	Concept	5.2.1.2	Negative	M3,M5
To indicate that a Goal can be achieved by performing several sub-tasks, model the decomposition by introducing a Task.	Beginner	Concept	5.2.1.3	Positive	M3,M4
Use multiple Means-End Links from Tasks to a Goal to indicate alternatives.	Beginner	Concept	5.2.1.4	Positive	M3,M4
Don’t mix Goals and Tasks in the Means-Ends links.	Beginner	Concept	5.2.1.5	Negative	M3,M4
Use precise language to name a Goal or a Task.	Beginner	Naming	5.2.1.6	Positive	M3,M4
A Goal can only be decomposed using Means-Ends Links.	Beginner	Concept	5.2.1.7	Positive	M4
Do not confuse between a Softgoal and a Task.	Beginner	Concept	5.2.2.1	Negative	M4,M5
Use the proper i* Softgoal notation.	Beginner	Notation	5.2.2.2	Positive	M5
Softgoals and Goals should be decomposed.	Intermediate	Concept & Evaluation	5.2.2.3	Positive	M3,M5
Do not confuse between a Task and a Resource.	Beginner	Concept	5.2.3.1	Negative	M4
Use a Resource when the Actor asks for the provision of a clearly defined and concrete resource.	Beginner	Concept	5.2.4.1	Positive	M1,M2

Table 11: Continued

Guideline	Level	Type	Number	Kind	Phase
Model a human or system as a resource only if you want to ignore their goals and intentions.	Beginner	Concept	5.2.4.2	Positive	M1,M2
Avoid overlapping elements inside or outside Actors.	Beginner	Layout	5.2.6	Negative	M1-M7
Connect each Strategic Dependency Link in an SR model to the correct element within the actor.	Beginner	Layout	5.2.7	Positive	M1,M7
Adopt or follow a consistent direction for the goal refinement/decomposition hierarchy as much as possible.	Beginner	Layout	5.2.8	Positive	M4,M6
Do not draw SR model elements outside the boundaries of the corresponding actors.	Beginner	Layout	5.2.9	Negative	M1,M2
Do not have unconnected elements within an Actor as this is indicative of an incomplete model.	Beginner	Layout	5.2.10	Negative	M1-M7
Means-Ends are only used to link a Task to a Goal.	Beginner	Concept	5.3.1	Positive	M3,M4
Be consistent with the direction of the Task Decomposition Link between a Task and sub Task or Resource.	Beginner	Concept	5.4.1	Positive	M4
Be consistent with the direction of the Task Decomposition Link between a Task and a Softgoal.	Beginner	Concept	5.4.2	Positive	M4,M6
Do not extend Decomposition Links beyond the boundaries of actors.	Beginner	Concept	5.4.3	Negative	M1,M4
Don't use the Task Decomposition Link or Means-End Link to refine Softgoals.	Beginner	Concept	5.4.4	Negative	M4,M6
Use Contribution Links from any element only to a Softgoal element.	Beginner	Concept	5.5.10	Positive	M6
Avoid introducing ad hoc or improvised link types. If you must, define their syntax and semantics as extensions to i*.	Beginner	Concept	5.5.11	Negative	M1-M7
Use the OR Contribution Links to indicate alternatives for sacrificing a Softgoal.	Beginner	Concept	5.5.12	Positive	M5,M6
Don't use Correlation or Contribution Links between actors.	Beginner	Concept	5.5.13	Negative	M2,M6
Don't use Correlation or Contribution Links from a Task to a Task.	Beginner	Concept	5.5.14	Negative	M4,M6
Use Contribution Links to refine a broad softgoal or non-functional requirement (NFR) into smaller components.	Beginner	Concept	5.8.1	Positive	M6
To facilitate systematic refinement, use Type and Topic naming convention for Softgoals.	Beginner	Naming	5.8.2	Positive	M5
Where Type and Topic structure is used, be consistent in each refinement step to refine either by Type or by Topic.	Beginner	Naming	5.8.3	Positive	M5,M6
Avoid including non standard elements or notations in the model.	Beginner	Naming	6.1	Negative	M1-M7
Be consistent when using colors in the models.	Beginner	Naming	6.2	Positive	M1-M7
Use a suitable font size for the element name.	Beginner	Naming	6.3	Positive	M1-M7
Select concise but informative phrases to name the elements.	Beginner	Naming	6.4	Positive	M1-M7
Don't extend the text of the name of the element beyond the element's border.	Beginner	Layout	6.5	Negative	M1-M7
Do not use Verbs in the names of Actors, Agents and Positions.	Beginner	Naming	6.6	Negative	M1,M2
Use clear names without ambiguous and unknown abbreviations or acronyms.	Beginner	Naming	6.7	Positive	M1-M7
Split a large and complex model into consistent pieces to facilitate easier presentation and rendering.	Intermediate	Layout	7.1	Positive	M1-M7
Don't zoom into a section of an Actor without showing the incoming and outgoing links with other Actors of the model.	Intermediate	Layout	7.2	Negative	M1-M7
Employ a systematic evaluation procedure	Intermediate	Evaluation	9.2.1	Positive	E1,E2
Formulate the analysis question before giving initial evaluation labels to elements	Beginner	Evaluation	9.2.2.1	Positive	E1,E2
Give initial labels to the elements in a manner consistent with the analysis question	Beginner	Evaluation	9.2.3.1	Positive	E1,E2
Give initial labels to all leaf elements, even if they are not directly involved in the analysis question	Beginner	Evaluation	9.2.3.2	Positive	E1,E2

Table 11: Continued

Guideline	Level	Type	Number	Kind	Phase
Contributions from multiple elements typically require human judgment	Intermediate	Evaluation	9.2.4.3	Positive	E1,X1-X5
Model the As-Is state of the knowledge domain and system without the presence of the new system To-Be introduced.	Beginner	Methodology	10.1.1	Positive	M1-M7
Do not include the new system To-Be introduced in the model of the As-Is state of the knowledge domain and system.	Beginner	Methodology	10.1.1	Negative	M1-M7
Model the To-Be state of the knowledge domain under analysis including the new To-Be system.	Beginner	Methodology	10.1.2	Positive	X1-X5
Start the modeling with the SD model to capture the stakeholders and their associated dependencies and interactions.	Beginner	Methodology	10.1.3	Positive	M1,M2,M7
Employ SR models to expand on the SD models and add the intentionality and rational dimension to the analysis.	Beginner	Methodology	10.1.4	Positive	M1-M7
Do not include internal intentional graphs of Actors in the SD model.	Beginner	Methodology	10.1.4	Negative	M1,M2,M7
Start an SD model with the actors, then add Dependency Links (Resources, Tasks, Goals, then Softgoals) consecutively.	Beginner	Methodology	10.2.1	Positive	M1-M7
Use the leaf-level tasks as the system requirements, not the high level Goals and Softgoals.	Beginner	Methodology & Layout	10.3	Positive	M1-M7

D.2 Game trees modeling guidelines

Table 12: Guidelines for game trees modeling.

Type refers to the type of modeling.

Sample Usage is a source document that provides the guideline.

Kind if the type of contribution made to the modeling process if the guideline is followed.

Phase is the phase of modeling explained in Figure 4.4.

Guideline	Type	Sample Usage	Page in Source	Kind	Phase
Text in names of corresponding model elements in i* SR model and Game Tree should be consistent	Naming	[24]	10	Positive	M1,M2,M5,M6
Do not use inconsistent names to refer to corresponding model elements in i* SR model and Game Tree	Naming	[24]	10	Negative	M1,M2,M5,M6
Represent Players as Nodes	Concept	[7]	3	Positive	M2
Represent Decisions as Edges	Concept	[7]	3	Positive	M6
Do not represent Players as Edges	Concept	[7]	3	Negative	M2
Do not represent Decisions as Nodes	Concept	[7]	3	Negative	M6
Represent an Actor in i* SR model as a Player in a Game Tree	Concept	[7]	3	Positive	M1-M3
Do not represent a Goal from i* SR model as a Player in the Game Tree	Concept	[7]	3	Negative	M2
Do not represent a Task from i* SR model as a Player in the Game Tree	Concept	[7]	3	Negative	M2
Do not represent a Resource from i* SR model as a Player in the Game Tree	Concept	[7]	3	Negative	M2
Do not represent a Softgoal from i* SR model as a Player in the Game Tree	Concept	[7]	3	Negative	M2
In i* SR model, represent Stakeholders that are Concrete Actors as Agents	Concept	[24]	6	Positive	M1,M3

Table 12: Continued

Guideline	Type	Sample Usage	Page in Source	Kind	Phase
In i* SR model, represent Stakeholders that are Abstract Actors as Roles	Concept	[24]	6	Positive	M1,M3
In i* SR model, do not represent Stakeholders that are Concrete Actors as Roles	Concept	[24]	6	Negative	M1,M3
In i* SR model, do not represent Stakeholders that are Abstract Actors as Agents	Concept	[24]	6	Negative	M1,M3
In Game Tree, represent Focal Player as First Mover	Methodology	[24]	6	Positive	M2
In i* SR model, denote additional actors that pertain to the relationship under study	Methodology	[7]	10	Positive	M3
In i* SR model, do not include extraneous actors that do not pertain to the relationship under study	Methodology	[7]	10	Negative	M3
Depict objectives with clear cut satisfaction criteria of each actor as Goals in i* SR model	Concept	[7]	3	Positive	M4
Do not depict objectives without clear cut satisfaction criteria of each actor as Goals in i* SR model	Concept	[7]	3	Negative	M4
Express alternatives for achieving each Goal in i* SR model as Tasks	Concept	[7]	3	Positive	M5
Represent a Decision (e.g., move or counter-move) in a Game Tree as a Task in i* SR model	Concept	[7]	5	Positive	M6
Do not represent a Decision (e.g., move or counter-move) in a Game Tree as a Actor in i* SR model	Concept	[7]	5	Negative	M6
Do not represent a Decision (e.g., move or counter-move) in a Game Tree as a Goal in i* SR model	Concept	[7]	5	Negative	M6
Do not represent a Decision (e.g., move or counter-move) in a Game Tree as a Resource in i* SR model	Concept	[7]	5	Negative	M6
Do not represent a Decision (e.g., move or counter-move) in a Game Tree as a Softgoal in i* SR model	Concept	[7]	5	Negative	M6
An Edge is used generally to connect two Players	Concept	[24]	6	Positive	M6
Rarely and in some cases an Edge can be used to connect the same Player if the same Player makes consecutive moves	Concept	[24]	6	Positive	M6
Do not use an edge to connect any other entities than Players in a Game Tree	Concept	[24]	6	Negative	M6
In Game Tree, represents a Decision Path as a unique continuous flow of Edges connecting the root Node to a specific Payoff	Layout	[24]	6	Positive	M6
In Game Tree, Depict a Decision Path as a continuous sequential flow of Edges connecting root Node to a specific payoff	Layout	[24]	6	Positive	M6
A terminal Edge shows the payoffs corresponding with a particular Decision path	Notation	[24]	6	Positive	E2
Only terminal Edges are connected with a Player on one side	Notation	[24]	6	Positive	M6
Do not connect a terminal Edge to Players on both sides	Notation	[24]	6	Negative	M6
Do not have a terminal Edge without a Payoff on one side	Notation	[24]	6	Negative	M6
Decision Path in a graph should go only in one direction from root Node towards leaf Nodes	Layout	BIR 2018	9	Positive	M6
Decision Path should be acyclic without any closure or loops	Layout	BIR 2018	9	Positive	M6
Do not include cycles or closures or loops in Decision Path in a Game Tree	Layout	BIR 2018	9	Negative	M6
Multiple options of moves and countermoves are depicted as Tasks and Sub-Tasks in the same i* model	Concept	[24]	8	Positive	M5
Moves are labeled with categorical integers	Naming	[24]	9	Positive	M5,M6
Options for counter-moves are labeled with their own categorical integers that are prefixed with the label of the move that they correspond to	Naming	[24]	9	Positive	M5,M6
There is no limit to the number of counter-move options that can correspond to a move	Concept	[24]	9	Positive	M5,M6

Table 12: Continued

Guideline	Type	Sample Usage	Page in Source	Kind	Phase
A counter-move to an earlier move can itself serve as a move to a future counter-move	Concept	[24]	9	Positive	M5,M6
Corresponding model elements in i* SR model and Game Tree should be named with the same identifiers	Naming	[24]	10	Positive	M1-M9
Do not name corresponding model elements in i* SR model and Game Tree with different identifiers	Naming	[24]	10	Negative	M1-M9
Softgoals for each actor should be portrayed with priorities in i* SR model	Notation	[24]	3	Positive	M7
Relative importance of each softgoal is depicted in i* SR model with one or more exclamation marks	Notation	[24]	3	Positive	M7
In i* SR model, single exclamation mark (!) is evaluated as having relatively lower priority than Double exclamation marks (!!)	Evaluation	[24]	3	Positive	E1,E2
Depict contributions from Tasks to Softgoals in i* SR model	Notation	[24]	5	Positive	M8
Depict contributions from Softgoals to other Softgoals in i* SR model	Notation	[24]	5	Positive	M8
In i* SR model, do not depict any entity as making contribution to a Goal	Notation	[24]	5	Negative	M8
In i* SR model, do not depict any entity as making contribution to a Task	Notation	[24]	5	Negative	M8
In i* SR model, do not depict any entity as making contribution to a Resource	Notation	[24]	5	Negative	M8
Express Dependencies among Actors in i* SR model	Concept	[24]	6	Positive	M9
Evaluate goal satisfaction by propagating labels in i* SR model	Evaluation	[24]	8	Positive	E1
Compute Payoffs for each Decision Path in Game Tree	Evaluation	[24]	10	Positive	E2
Do not leave out Payoff for any Player involved in a decision path	Evaluation	[24]	10	Negative	E2
Do not use different sequences for listing Payoffs associated with different decision paths	Evaluation	[24]	10	Negative	E2
Depict Payoffs in Game Trees on the side of terminal Edge that is not connected to a Player	Notation	[24]	3	Positive	E2
In Game Tree, do not depict Payoffs on the side of terminal Edge that is connected to a Player	Notation	[24]	3	Negative	E2
Calculate Payoffs in Game Tree by evaluating satisfaction and denial of associated softgoals in i* SR model	Evaluation	[24]	10	Positive	E1,E2
While calculating associated Payoffs in Game Tree consider the relative priorities of softgoals in i* SR model	Evaluation	[24]	10	Positive	E1,E2
Detect presence of win-win, win-lose, and lose-lose strategies in Game Tree by comparing outcomes for each Player	Evaluation	[7]	5,9	Positive	E3
Assess strategy that only contains positive payoffs for each Player Win-Win	Evaluation	[7]	2	Positive	E3
Assess strategy that contains atleast one positive and atleast one negative payoff for Players as Win-Lose	Evaluation	[7]	2	Positive	E3
Assess strategy that only contains negative payoffs for each Player as Lose-Lose	Evaluation	[7]	2	Positive	E3
Iterate over steps until desired number of Win-Win strategies is created	Methodology	[7]	10	Positive	X1-X5
Create a new configuration by: (i) adding/removing some actor, (ii) generating a change in some actors goal, (iii) additional alternatives for achieving goals of some actor, (iv) softgoals of some actor, (v) change in relationships among two actors in i* SR model	Methodology	[7]	10	Positive	X1-X5

D.3 e3value model modeling guidelines

Table 13: Guidelines for e3value modeling.

Type refers to the type of modeling.

Sample Usage is a source document that provides the guideline.

Kind if the type of contribution made to the modeling process if the guideline is followed.

Phase is the phase of modeling explained in Figure 4.5.

Guideline	Type	Sample Usage	Page in Source	Kind	Phase	Evaluation
Start idea exploration with the alternative that is most likely to be successful, but also investigate other alternatives, using knowledge from previous iterations.	Methodology	[76]	33	Positive	M1-M9	N/A
Do not ignore knowledge from previous iterations while exploring new ideas for alternatives to achieve objectives.	Methodology	[76]	33	Negative	M1-M9	N/A
Start idea exploration for improving an existing or AS-IS situation by first modelling and evaluating the current situation.	Methodology	[76]	33	Positive	M1-M9,E1-E5,X1-X5	keep
Do not model the TO-BE situation prior to adequately modeling the AS-IS situation first	Methodology	[76]	33	Negative	M1-M9,E1-E5,X1-X5	keep
Exploration of new ideas for TO-BE situation is triggered by identification of new opportunities.	Concept	[76]	34	Positive	X1-X5	N/A
Explore ideas for exploring new alternatives in terms of TO-BE situation by: (i) gathering information about the domain (ii) writing down a short description of the idea (iii) modelling one or more alternatives (iv) evaluating generated alternatives.	Methodology	[76]	34	Positive	X1-X5	N/A
Do not ignore domain knowledge or subject matter expertise when exploring new ideas for alternatives to achieve objectives.	Methodology	[76]	34	Negative	X1-X5	N/A
Add identified parties involved to the SD model as Actors.	Concept	[76]	35	Positive	M1-M2	keep
Do not add identified parties in e3Value to the SD model as Goals.	Concept	[76]	35	Negative	M1-M2	keep
Do not add identified parties in e3Value to the SD model as Tasks.	Concept	[76]	35	Negative	M1-M2	keep
Do not add identified parties in e3Value to the SD model as Resources.	Concept	[76]	35	Negative	M1-M2	keep
Do not add identified parties in e3Value to the SD model as Softgoals.	Concept	[76]	35	Negative	M1-M2	keep
Assign abstract Actors (i.e., Roles) that focus on creating value to the concrete Actors (i.e., Agents) in the SD model.	Concept	[76]	35	Positive	M1-M2	keep
Leave out Infrastructure providers as actors involved in the cooperation strategy idea.	Concept	[76]	35			keep
Add Goal, Softgoal and Resource Dependency relationships, representing Objects of economic value, between Actors.	Concept	[76]	36	Positive	M7	keep
Add Softgoal Dependency relationships, representing quality attributes of Objects of economic value, between Actors.	Concept	[76]	37	Positive	M7	keep
If necessary, divide the SD model into several models, which only contain part of all the Actors involved, Depending on the complexity of the alternative.	Layout	[76]	37	Positive	M1,M2,M7	keep
Do not create visually complicated or graphically complex model when it is possible to create simpler and smaller models that can fit together	Layout	[76]	37	Negative	M1-M9	keep

Table 13: Continued

Guideline	Type	Sample Usage	Page in Source	Kind	Phase	Evaluation
Determine if an i* Actor maps to an e3value Actor or a Market Segment.	Concept	[76]	38	Positive	M1,M2,M8	keep
Composite e3value Actor represents a higher-level Actor that is composed of several lower-level Actors.	Concept	[76]	38	Positive	M8	keep
Add a composite e3value Actor for multiple i* Actors that are a part of a larger Actor.	Concept	[76]	38	Positive	M8	keep
Do not add a composite e3value Actor for multiple i* Actors that are not parts of the same Actor.	Concept	[76]	38	Negative	M8	keep
Determine the detail of the e3value Actor model(s) based on the detail of the i* SD model(s).	Methodology	[76]	39	Positive	M1,M2,M8	keep
Do not create e3Value and i* SD models with inconsistent levels of detail	Methodology	[76]	39	Negative	M1,M2,M8	keep
Create e3value Objects based on the names of the Dependencies between i* Actors.	Naming	[76]	39	Positive	M7,M8	keep
Do not create e3value Objects, that are based on the names of the Dependencies between i* Actors, using other or different names.	Naming	[76]	39	Negative	M7,M8	keep
Add Value Interfaces to each e3value Actor based on the Dependencies between corresponding i* Actors.	Notation	[76]	40	Positive	M7,M8	keep
Relate Value Interfaces of each e3value Actor via Value Exchanges in the opposite direction of the Dependencies between the corresponding i* Actors.	Notation	[76]	40	Positive	M7,M8	keep
Do not relate Value Interfaces of each e3value Actor via Value Exchanges in the same direction as the Dependencies between the corresponding i* Actors.	Notation	[76]	40	Negative	M7,M8	keep
If, while converting the i* SD model to an e3value Actor model, problems or inconsistencies between the two models arise then adjust the SD model using the guidelines indicated above.	Methodology	[76]	41	Positive	M1,M2,M8	keep
Add strategic Goals and Tasks to i* Actors, accompanied by the Softgoals indicating quality attributes of those strategic intentions, and the Softgoals that contribute, constrain or enable the strategic Goals and Tasks to be satisfied.	Methodology	[76]	42	Positive	M3,M5	keep
Add Tasks, possibly deconstructed into sub-tasks, to each Actor; these Tasks aim at reaching the strategic elements internal to the Actors.	Methodology	[76]	42	Positive	M4	keep
Assign the Dependencies that represent economic value between Actors, taken from the SD model, to the Tasks internal to those Actors in the SR model that need those to be satisfied in order to be carried out.	Methodology	[76]	43	Positive	M7	keep
Assign the Softgoal Dependencies between Actors, taken from the SD model, that represent quality attributes of Objects of economic value, to the strategic Goals, Tasks, and Softgoals internal to those Actors in the SR model.	Methodology	[76]	43	Positive	M7	keep
If new Dependencies are identified while constructing an SR model, add these to the corresponding SD model.	Methodology	[76]	44	Positive	M7	keep
Do not omit new Dependencies that are identified while constructing an SR model from the corresponding SD model.	Methodology	[76]	44	Negative	M7	keep
Determine which level of decomposition of Tasks internal to i* Actors should be mapped to Value Activities in the Value Activity model.	Evaluation	[76]	44	Positive	M4,M9	keep

Table 13: Continued

Guideline	Type	Sample Usage	Page in Source	Kind	Phase	Evaluation
Assign Value Interfaces to each e3value Value Activity based on the intentional elements that the corresponding i* Task Depends on and is willing to sacrifice in return.	Methodology	[76]	45	Positive	M3,M5,M9	keep
Relate Value Interfaces of Value Activities internal to the same e3value Actor based on the Dependencies between the corresponding i* Tasks, which are internal to the corresponding i* Actor.	Notation	[76]	46	Positive	M7,M9	keep
Relate Value Interfaces of Value Activities willing to exchange Value Objects with other Actors-indicated by a task within an Actor sharing Dependencies with a Task internal to another Actor in the SR model to Value Interfaces at Actor boundary.	Notation	[76]	46	Positive	M7,M9	keep
If, while converting the i* SR model to an e3value Activity model, problems or inconsistencies between the two models arise then adjust the SR model using the guidelines indicated above.	Methodology	[76]	47	Positive	M1-M9	keep
In evaluating an e3value Activity model, focus on the e3value constructs corresponding to all Softgoals in the i* SR model.	Evaluation	[76]	47	Positive	E1-E5	keep
In evaluating an e3value Activity model, do not merely focus on the e3value constructs corresponding to higher-level Softgoals in the i* SR model, but also on the low-level Softgoals that explain the rationale in more detail.	Evaluation	[76]	47	Negative	E1-E5	keep
Satisfy all labels in the i* SR model.	Evaluation	[76]	48	Positive	E1-E5	keep
Do not leave any labels in the I* SR model unsatisfied.	Evaluation	[76]	48	Negative	E1-E5	keep
Import the e3value Activity model analysis results into the i* SR model by labelling the corresponding Softgoals internal to Actors concerning economic value.	Naming	[76]	48	Positive	E1-E5	N/A
Propagate the labels, imported from the e3value Activity model evaluation to the Goals, intentions and Dependencies within the i* SR model ,using a qualitative labelling algorithm.	Notation	[76]	49	Positive	E1-E5	N/A
Do not use a quantitative assessment mechanism to evaluate the satisfaction of elements in an i* SR model.	Evaluation	[76]	49	Negative	E1-E5	N/A
Do not judge implementation alternative's viability only on higher-level Softgoal labels, but also on checkmark labels of lower-level Softgoals in the i* SR model.	Evaluation	[76]	49	Negative	E1-E5	N/A
Use Goals, intentions and Dependencies labelled weakly satisfied, conflict/irresolvable, undecided, weakly denied, and denied to identify points of improvement for new implementation alternatives to be explored in a next iteration.	Methodology	[76]	49	Positive	E3,E5	N/A
Detect if the Value Added by any Activity can be increased by assessing e3Value and i* SR models.	Evaluation	[22]	10-11	Positive	E3	N/A
Value Added of an Activity refers to the incremental increase in the worth of a Value Object attributable to that Activity.	Concept	[22]	10-11	Positive	E3	N/A
Value Added of an Activity does not refer to the increase in the overall worth of the value network attributable to the presence of any actor.	Concept	[22]	10-11	Negative	E3	N/A
Detect if the Added Value of any Actor can be increased by assessing e3Value and i* SR models.	Evaluation	[22]	12-13	Positive	E5	N/A
Added Value of an Actor refers to the increase in the overall worth of the value network attributable to the presence of that Actor.	Concept	[22]	12-13	Positive	E5	N/A
Added Value of an Actor does not refer to the incremental increase in the worth of a Value Object attributable to any Activity	Concept	[22]	12-13	Negative	E5	N/A

Table 13: Continued

Guideline	Type	Sample Usage	Page in Source	Kind	Phase	Evaluation
Iterate over steps until Value Added of Activities and Added Value of Actors is increased as desired.	Methodology	[22]	10-13	Positive	M1-M9,E1-E5,X1-X5	N/A
Do not stop iterating over steps until Value Added of Activities and Added Value of Actors is increased as needed.	Methodology	[22]	10-13	Negative	M1-M9,E1-E5,X1-X5	N/A
Create a new configuration by: (i) adding/removing some Actor, (ii) generating a change in some Actor's Goal, (iii) additional alternatives for achieving Goals of some Actor, (iv) Soft-goals of some Actor, (v) change in relationships among two Actors in i* SR model	Methodology	[22]	4-10	Positive	X1-X5	N/A