# USING CASUAL LOOP DIAGRAM TO BETTER UNDERSTANDING OF e-BUSINESS MODELS

M. R. Gholamian, A. Hamzehei
*Department of Electronic Commerce, Iran University of Science and Technology (IUST), Narmak, Tehran, Iran*
*gholamian@iust.ac.ir, a_hamzaii@ind.iust.ac.ir*

B. Kiani
*Green Research Center, Iran University of Science and Technology (IUST), Narmak, Tehran, Iran*
*kiyani@iust.ac.ir*

S.H. Hosseini
*Department of Industrial Engineering, Iran University of Science and Technology (IUST), Narmak, Tehran, Iran*
*hoseini@ind.iust.ac.ir*

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Abstract: Using the concept of business models can help companies understand, communicate, share, change, measure, simulate and learn more about the different aspects of e-business in their firms. Better understanding of e-business models helps managers and related staffs to better apply the business model. The main objective of this paper is to use Causal Loop Diagram (CLD) as a useful tool to capture the structure of e-business systems in order to achieve a better understanding of an e-business model. The proposed CLD gives a helpful insight which is useful for managers to learn more about the e-business model.

## 1 INTRODUCTION

We live in a competitive, rapidly changing and an increasingly uncertain economic environment that makes business decisions complex and difficult. Companies are confronted with new information and communication technologies, shorter product life cycles, global markets and tougher competition. In this hostile business environment firms should be able to manage multiple distribution channels, complicated supply chains, expensive IT implementations, and strategic partnerships and still stay flexible enough to react to market changes. Astonishingly, the concepts and software tools that help managers facilitate strategic business decisions in this difficult environment are still scarce (Osterwalder, 2004). Every manager and entrepreneur does have an intuitive understanding of the company's business model, but even though this business model influences all important decisions, in many cases she or he is rarely able to communicate it in a clear and simple way (Linder and Cantrell, 2000). How can one decide on a particular business issue or change it, if it is not clearly understood by the parties involved? Therefore, it would be interesting to think of a set of tools that would allow business people to understand what their business model would be and of what essential elements it could be composed of, tools that would let them easily share this model to others and that would let them change and play around with it in order to learn about business opportunities (Osterwalder, 2004).

A business model is often defined as an architecture for the product, service and information flows, including business actors, potential benefits, and sources of revenues, or as a method for managing resources to provide better customer values and make money (Afuah and Tucci, 2001; Terano and Naitoh, 2004; Chien-Chih Yu, 2005).

Above all, a business model is a model of a business. A model, on the other hand, is only an artificial representation of reality. It therefore has to detract focus from certain aspects while

concentrating on others; it is impossible for all the variables that comprise reality to be adequately and consistently represented, particularly if the goal is to control for the effect of certain factors over others. A model can be descriptive or predictive, but in many cases people would not rely on the outcomes of the model only, when making a decision. This is because a model cannot (and should not) be a complete and precise representation of reality—even for very simple social systems. Even if it could, people would not recognize it as such, because as what is considered to be important for the model depends on the position of the observer (Petrovic et al., 2002).

Recalling all said above, the importance of an e-business model usage in the performance of an e-business model is brightly evident. In the other hand, a good understanding of e-business model has a great impact on the quality and level of its utilization. Therefore, in this paper, we will use Causal Loop Diagram (CLD) as a useful tool to find out the structure of e-business systems in order to achieve a better understanding of an e-business model. To do so, we will use a specific e-business model, called e-Business Model Ontology (BMO). Following, in the paper, in the next section we describe the BMO and its building blocks. In the section 3, CLD will be introduced and finally we will show how CLD can be used to give a better understanding and explaining of e-business model especially BMO.

## 2 e-BUSINESS MODEL ONTOLOGY

Alexander Osterwalder in 2004 worked on an E-Business model which includes almost all areas of E-Business as his doctoral thesis. This section tries to explain his model named E-Business Model Ontology. This E-Business model is an ontology that allows to accurately describing the business model of a firm. Influenced by the Balanced Scorecard approach (Kaplan and Norton, 1992), and more generally business management literature (Markides, 1999) suggested adopting a framework which emphasizes on the following four areas that a business model has to address:

- *Product:* What business the company is in, the products and the value propositions offered to the market.
- *Customer Interface:* Who the company's target customers are, how it delivers products and services to them, and how it builds a strong relationship with them.
- *Infrastructure Management:* How and with whom the company efficiently performs infrastructural or logistical issues, and under what kind of network enterprise.
- *Financial Aspects:* What is the revenue model, the cost structure and the business model's sustainability?

These four areas can be compared to the four perspectives of Norton and Kaplan's Balanced Scorecard approach (Kaplan and Norton, 1992). The Balanced Scorecard is a management concept developed in the early 90s that helps managers measure and monitor indicators other than purely financial ones. Norton and Kaplan identify four perspectives of the firm on which executives must keep an eye to conduct successful business. From the customer perspective the company asks itself how it is being seen by its customers. From the Internal perspective, the company reflects on what it must excel at. From the innovation and learning perspective the company analyzes how it can continue to improve and create value. Finally, from the financial perspective a company asks itself how it looks at shareholders. While the four areas are a rough categorization the nine elements are the core of the ontology. These elements, presented in Table 1, are a synthesis of the business model literature review and consist of value proposition, target customer, distribution channel, relationship, value configuration, capability, partnership, cost structure and revenue model. Figure 1 gives the reader a first impression of the business model ontology and depicts how the mentioned Business Model Ontology elements are related to each other.

Every business model element can be decomposed into a set of defined sub elements. As illustrated in the graphical descriptions and defined in the tables, element and sub-elements are related to each other through "setof" and "isA" relationships. *Product* covers all aspects of what a firm offers its customers. This comprises not only the company's bundles of products and services but the manner in which it differentiates itself from its competitors. *Product* is composed of the element *value proposition*, which can be decomposed into its elementary *offering*(s) (see Figure 2).

Table 1: The nine business model building blocks (Osterwalder, 2004).

| Pillar | Building Block of Business Model | Description |
|---|---|---|
| Product | **Value Proposition** | A Value Proposition is an overall view of a company's bundle of products and services that are of value to the customer. |
| Customer Interface | **Target Customer** | The Target Customer is a segment of customers a company wants to offer value to. |
| | **Distribution Channel** | A Distribution Channel is a means of getting in touch with the customer. |
| | **Relationship** | The Relationship describes the kind of link a company establishes between itself and the customer. |
| Infrastructure Management | **Value Configuration** | The Value Configuration describes the arrangement of activities and resources that are necessary to create value for the customer. |
| | **Capability** | A capability is the ability to execute a repeatable pattern of actions that is necessary in order to create value for the customer. |
| | **Partnership** | A Partnership is a voluntarily initiated cooperative agreement between two or more companies in order to create value for the customer. |
| Financial Aspects | **Cost Structure** | The Cost Structure is the representation in money of all the means employed in the business model. |
| | **Revenue Model** | The Revenue Model describes the way a company makes money through a variety of revenue flows. |

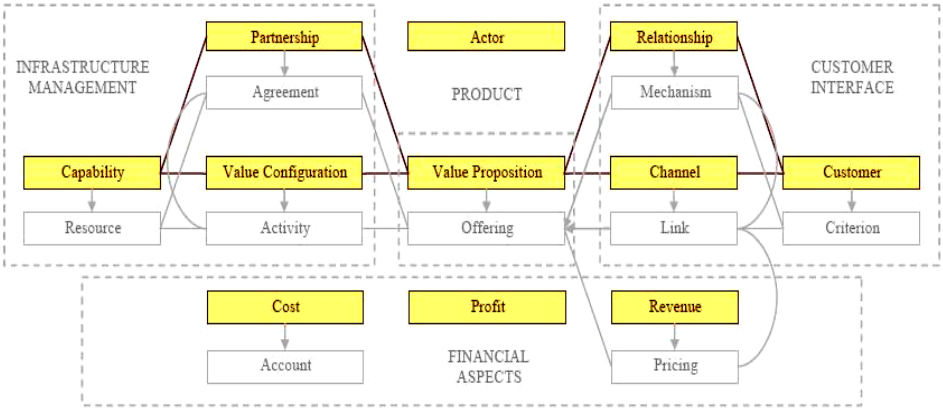


Figure 1: The Business Model Ontology (Osterwalder, 2004).

The element *value proposition* is an overall view of one of the firm's bundles of products and services that together represent *value for* a specific *customer segment*.

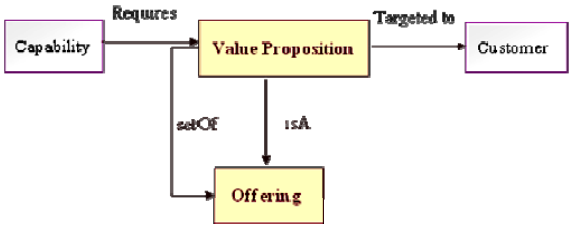


Figure 2: Product.

It describes the way a firm differentiates itself from its competitors and is the reason why customers buy from a certain firm and not from another one.

The *target customer* is the second element of the business model ontology (Figure 3). Selecting a company's target customers is all about the segmentation. Effective segmentation enables a company to allocate investment resources to target customers that will be most attracted by its value proposition. The *target customer* definition will also helps a firm to define through which channels it effectively wants to reach its clients. In order to refine a customer segmentation companies usually decompose a *target customer* segment into a set of further characteristics called criterion.

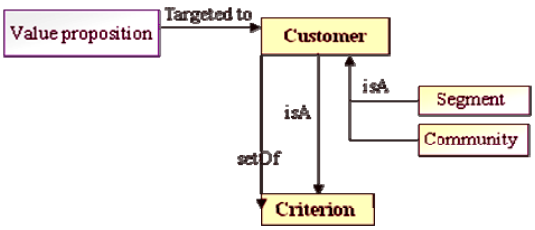


Figure 3: Target Customer.

The distribution *channel* is the third element of the business model ontology (Figure 4). Distribution channels are the connection between a firm's *value propositions* and its *target customers*. A distribution channel allows a company to deliver a value to its customer directly. A distribution *channel* describes how a company gets in touch with its customers. Its purpose is to make the right quantities of the right products or services available at the right place, at the right time to the right people (Pitt and Berthon, 1999).

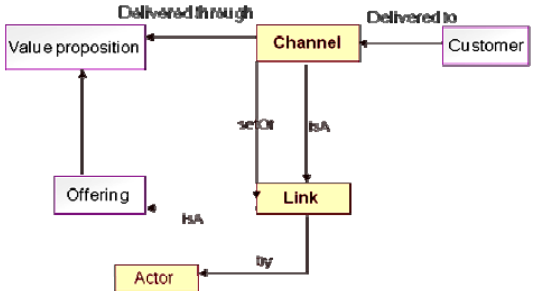


Figure 4: Distribution Channel.

The fourth element of the business model ontology concerns the *relationship*s a company builds with its customers (Figure 5). All customer interactions between a firm and its clients affect the strength of the relationship a company builds with its customers. But as interactions come at a given cost, firms must carefully define what kind of relationship they want to establish with what kind of customer. Profits from customer relationships are the lifeblood of all businesses. These profits can be achieved through the acquisition of new customers, the enhancement of profitability of existing customers and the extension of the duration of existing customer relationships. Companies must analyze customer data in order to evaluate what type of customer they want to seduce and acquire, whether they are profitable and worth spending retention efforts or not and whether they are likely to be subjected to add-on selling or not (Blattberg and Getz, 2001). Then firms must define the different mechanisms they want to use to create and maintain a customer relationship and leverage customer equity.

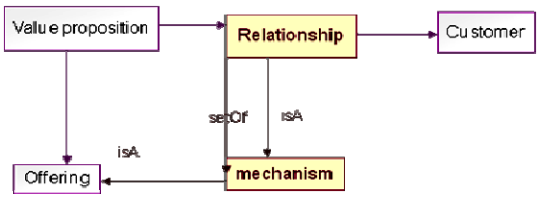


Figure 5: Relationship.

*Capability* is the fifth element of the business model ontology (Figure 6). Capabilities described as repeatable patterns of action in the use of assets to create, produce, and/or offer products and services to the market. Thus, a firm has to dispose of a set of *capability*ies in order to provide its *value proposition*. These capabilities depend on the assets or resources of the firm. And, increasingly, they are outsourced to partners, while using e-business technologies to maintain the tight integration that is necessary for a firm to function efficiently.

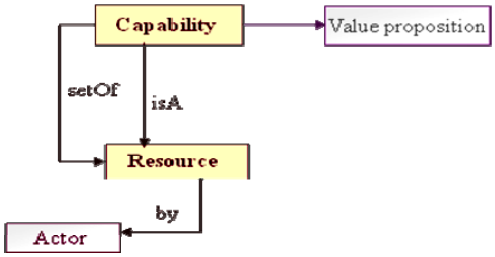


Figure 6: Capability.

The *value configuration* is the sixth element of the business model ontology (Figure 7). The *value configuration* of a firm describes the arrangement of one or several *activity* (ies) in order to provide a *value proposition*. As outlined above, the main purpose of a company is the creation of value that customers are willing to pay for. This value is the outcome of a configuration of inside and outside activities and processes. The *value configuration* shows all activities necessary and the links among them, in order to create value for the customer.

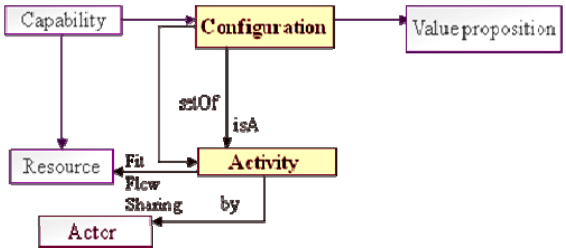


Figure 7: Value Configuration.

The seventh element of the business model ontology is the *partnership network*. A *partnership* is a voluntarily initiated cooperative agreement formed between two or more independent companies in order to carry out a project or specific activity jointly by coordinating the necessary *capability*ies, *resources* and *activity*ies. A company's partner network outlines which parts of the activity configuration and which resources are distributed among the firm's partners.

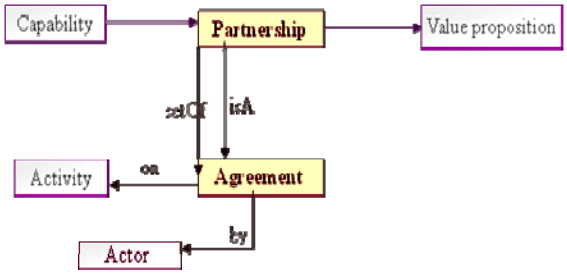


Figure 8: Partnership.

The REVENUE MODEL is the eighth element of the business model ontology and it measures the ability of a firm to translate the value it offered to its customers into money and incoming revenue streams.

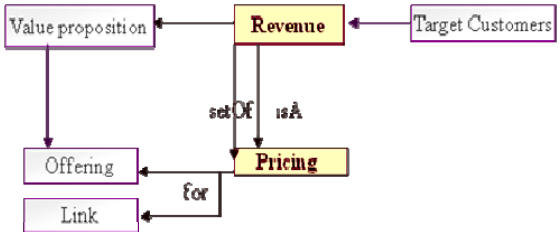


Figure 9: Revenue Model.

This element measures all the costs the firm incurs in order to create, market and deliver value to its customers. It sets a price tag on all the resources, assets, activities and partner network relationships and exchanges that cost the company money. As the firm focuses on its core competencies and activities and relies on partner networks for other non-core competencies and activities there is an important potential for cost savings in the value creation process.

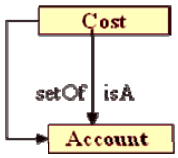


Figure 10: Cost Structure.

# 3 CAUSAL LOOP DIAGRAM

Yet our mental models often fail to include the critical feedbacks determining the dynamics of our systems. A useful way to capture the structure of systems is causal loop diagram (CLD) (Sterman, 2000). The casual loop diagram represents the way in which a system works. The primary purpose of the CLD is to depict casual hypothesis, so as to make the presentation of the structure in an aggregate form. The CLD helps the user to quickly communicate the feedback structure and underlying assumptions (Sushil, 1993). CLDs are an important tool for representing the feedback structure of systems. Long used in academic work, and increasingly common in business, CLDs are excellent for (Sterman, 2000):

- Quickly capturing your hypotheses about the causes of dynamics;
- Eliciting and capturing the mental models of individuals or teams;
- Communicating the important feedbacks you believe are responsible for a problem.

A causal diagram consists of variables connected by arrows denoting the causal influences among the variables. The important feedback loops are also identified in the diagram. Variables are related by *causal **links,*** shown by arrows (Sterman, 2000). The casual relationship depicts that one element affecting another element. A causal loop diagram has been used to model this causality relationship. Positive relationship refers to ‘a condition in which a casual element, A, results in a positive influence on B, where the increase of A value responds to the B value with a positive increase’ and Negative relationship refers to ‘a condition in which a causal element, A, results in a negative influence on B, where the increase of A value responds to the B value with a decrease’ (Richardson, 1986).

Link polarities describe the structure of the system. They do not describe the behavior of the variables. That is, they describe what would happen **IF** there were a change. They do not describe what actually happens. The causal diagram doesn’t tell you what *will* happen. Rather, it tells you what *would* happen if the variable were to change (Sterman, 2000).

The important loops are highlighted by a loop identifier which shows whether the loop is a positive (reinforcing) or negative (balancing) feedback. The dynamic behavior of the system can be caused by a feedback loop, and there are two types of feedback: reinforcing (R) and balancing (B). As shown in figure 11, increases in population increases the number of birth, which again increases the overall population. It is a reinforcing loop. In the contrary, the greater the population, the higher the number of deaths, and then the population decrease. It is a balancing loop. In addition, it is not easy to understand the complexity involved with the dynamic changes among elements and the target

system in which casual relationships and feedback loops exist.

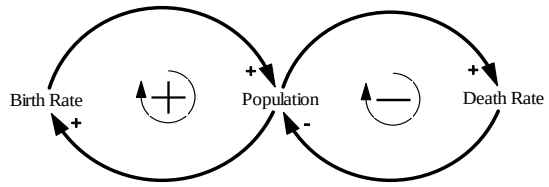


Figure 11: The diagram of casual relationship.

In the next section we will develop a CLD to explain the logic and structure of the introduced e-business model and consequently we will show how that CLD is validated.

# 4 USING CLD TO BETTER UNDERSTANDING OF BMO

In this section Casual Loop Diagram is used to give a better understanding of introduced e-business model which was in pervious section. The CLD is drawn based on the BMO; it explains the logic of model and shows the interaction of each model building blocks; it also facilitates the understanding of the model and consequently facilitates the applying of it. We draw a simple CLD which only shows the main loops and main interactions in order to having a well-defined CLD that is consistent with the purpose of this paper. Figure 12 shows the CLD. There are six loops shown partially in different colors in the figure as follows:

- PROSPERITY (balancing loop; in blue)
- OFFERING (reinforcing loop; partially in red)
- RESOURCE SUPPLEMENT (balancing loop; partially in green)
- ACTIVITY ARRANGEMENT (balancing loop; partially in purple)
- CHANNEL ADJUSTMENT (balancing loop; in orange)
- CUSTOMER RELATIONSHIP CONTROL (reinforcing loop; partially in black)

Following, we describe these loops:

The logic of the first loop, named PROSPERITY, is as follows: As Capabilities increase, ceteris paribus, with correct management, the Offering of company increases. This rise in Offering, ceteris paribus, causes a rise in the Value which proposed to the customer; therefore, as a result, Customer population increases due to a higher value proposition which satisfied customers. This increase causes an increase in Revenue. Consequently, this rise, ceteris paribus, causes an increase in Profit and then causes an increase in the dedicated amount of profit for raising Resources which closes the loop and ensures that, ceteris paribus, over time Capabilities will be higher than it otherwise would have been. This loop shows the interaction of the all four blocks of the model showed in Figure 1: INFRASTRUCTURE, PRODUCT, CUSTOMER INTERFACE, and FINANCIAL ASPECTS.

The logic of the second loop, named OFFERING, is as follows: As in pervious loop mentioned, an increase in Capabilities finally causes a rise in Value Proposition which causes having more Costs. This rise in costs, ceteris paribus, causes a decrease in Profit which causes a fall in the dedicated amount of profit for raising Resources. This fall closes the loop and ensures that, ceteris paribus, over time Capabilities will be lower than it otherwise would have been. This loop shows the interaction of the three blocks of the model showed in Figure 1: INFRASTRUCTURE, PRODUCT, and FINANCIAL ASPECTS.

The logic of the third loop, named RESOURCE SUPPLEMENT, is as follows: A fall in Capabilities causes a rise in Partnership since the company needs more investment to improve its Resources and consequently its Capabilities. A rise in Partnership, as said, causes a rise in Funding and therefore, ceteris paribus, causes a rise in Resources. This closes the loop and ensures that, ceteris paribus, over time Capabilities will be higher than it otherwise would have been. This loop shows the interaction of one block of the model showed in Figure 1: INFRASTRUCTURE.

The logic of the fourth loop, named ACTIVITY ARRANGEMENT, is as follows: A fall in Capabilities causes a rise in Partnership for the reason that the company needs more Capabilities and more abilities to configure these Capabilities in order to more Offering. As Partnership rises the Ability of company to configure the Capabilities rises and, ceteris paribus, it causes a rise in Offering. As said above, this finally raises Capabilities. This loop shows the interaction of the two blocks of the model showed in Figure 1: INFRASTRUCTURE and PRODUCT.

The logic of the fifth loop, named CHANNEL ADJUSTMENT, is as follows: As Customer Identification increases, the Compatibility of Linking Channel which company chooses to make relationship with customers rises. This, ceteris paribus, causes a rise in the Performance of Linking Channel.

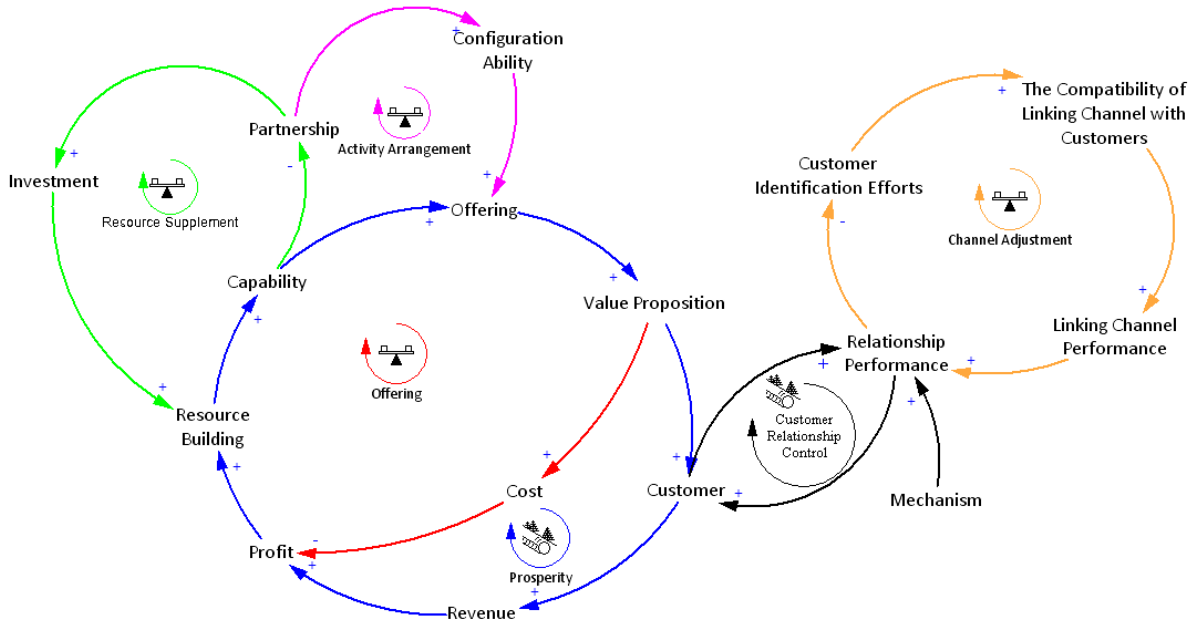


Figure 12: The Casual Loop Diagram of e-Business Model Ontology.

This rise and the type of Mechanisms which company uses finally raise the total Performance of Relationship with customers. When company has a good insight about its customers and its customer Relationship Performance is high, the company makes fewer efforts for Identification of its customers because it knows the customers very well. It is obvious that when customer Relationship Performance rises the Customer population rises too. This loop performs in one block of the model showed in Figure 1: CUSTOMER INTERFACE.

There is another loop which shows the relationship between the last loop (CHANNEL ADJUSTMENT) and others which named as CUSTOMER RELATIONSHIP CONTROL; as Relationship Performance increases, with sufficient and excellent Value Proposition, Customer population rise; the increase in Customers, with appropriate Mechanisms, causes a rise in Relationship Performance.

The main loops, which produce the dynamic behavior, are described above. In the section 2 the models building blocks is introduced and the constituted components is delineated. In this section we tried to show the relationships and the impacts of building blocks on each others. The readers that have an understanding with these relationships and impacts could have better understanding of BMO; therefore, this will be useful for practical purposes.

# 5 CONCLUSIONS

A business model is often defined as architecture for the product, service and information flows, including business actors, potential benefits, and sources of revenues, or as a method for managing resources to provide better customer values and making money. The importance of an e-business model usage in the performance of an e-business model is brightly evident. In the other hand, a good understanding of e-business model has a great impact on the quality and level of its utilization. Therefore, in this paper, we used CLD as a useful tool to capture the structure of e-business systems in order to achieving a better understanding of an e-business model. To do so, we used a specific e-business model, called e-Business Model Ontology (BMO) and described its building blocks. In the section 3, CLD is introduced and finally we showed how CLD can be used to give a better understanding and explaining of e-business models, especially BMO. Further research could be drawing of the Stock Flow Diagram (SFD) which can be used for sensitivity analysis, scenario building, and policy analysis for practical purposes. The limitation of this research is investigating this approach in a case study in order to find a practical usage of this research.

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