

Literature Review on Organizational Path

Dependence

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Abstract

Path Dependence is a popular and constantly developing research area where there are so many definitions; however there is not a commonly accepted definition. Some researchers support that it should be accepted as a theory, while others believe that it is nothing more than just a point of view. Path dependence is generally defined as all type of historical effects on an organization's present and future choices and decisions. There are lots of factors affecting an organization's activities, such as its history, heritage, corporate culture, employee competences, etc. Applying a specific activity type comes with not only its own costs, but also comes with switching costs, if any changes are needed to be taken into action. Academicians supporting path dependence as a theory suggest that it a process with some mechanisms, like lock-in phases and self-reinforcements with positive feedbacks. Path Dependence theory supporters suggest that; in order a path to become dependent, these mechanisms must appear during the process. In this study, path dependence definitions will be given with different aspects of the researchers. Then, lock-in and self-diminishing, constant and increasing self-reinforcing mechanisms will be explained in detail. Some theoretical models on path dependence will be presented in order to objectify the definitions and explanations. This study is aimed to bring general conceptual information on the path dependence literature.

Keywords: Path Dependence, Lock-in, Self-Reinforcing Mechanisms

1. Introduction

Brian Arthur and Paul David are the founders of path dependence in the literature. Arthur is the first researcher who has modeled a formal path dependence theory and claimed constant returns to be the main process drivers. His paper 'Competing Technologies, Increasing Returns, and Lock-in By Historical Events (1989)' is accepted as the starter of all path dependence discussions. Arthur (1989) defines path dependence as being locked-into historical events. According to him, it is

impossible to make exact future predictions, such as foreseeing the development of a technology. Decision makers become locked-into inferior outcomes as a result.

Past experiences enable the coordination of individual behaviors by mutually compatible expectations, without a central manipulation. In very large organizations, past experiences are related with long term information channels and the similarities of the information codes. Past experiences also contain the complementary elements of complex organizations and the interrelation of the constraints of certain rules and procedures. David (1985) suggests that temporarily discrete and random events are much more effective on the final outcome rather than the systematical forces, and these events pave the way to path dependence. In his 1994 paper, David explains the importance of organizational history. David (1994) also mentions North (1991)'s saying: "Institutions are the carriers of history. They incrementally evolve by connecting their past, today and future."

Path dependence implies a narrowing organizational process and a situation where it is impossible for an organization to shift to alternative options. According to Sydow, Schreyögg and Koch (2009), if an organization is not capable of alternative options, it carries the risk of inefficiency because it is deprived of different inner or outsider situations that necessitate new solutions. The organization will not adapt to the necessities of change and it becomes locked-into past solutions. The supporting advantages at the beginning of organizational processes turn into strong barriers and losses against change during the development of the processes. In short, organization path dependence is defined as potentially inefficient action structure of an organization's processes. This structure is formed by the results of the former decisions and the support of the positive feedback mechanisms.

The paper proceeds as follows. The following section outlines the path dependence definitions of relevant literature. Then the mechanisms which lead to path dependence will be explained. These are the self-reinforcing and lock-in mechanisms. An organizational path dependence model from the literature is going to be explained in the end.

2. Path Dependence Definitions

According to Sydow, Schreyögg and Koch (2009), a general path dependence definition does not exist. The concept is used in figurative senses, rather than theoretical. Almost all path dependence opinions highlight the importance of past events and decisions over present ones. As Teece, Pisano and Shuen (1997) indicates, past rarely stays in the past. The main claim is the importance of the past on explaining the strategic choices and organizational mistakes. However, focusing only on the former mistakes is a too broad point of view. All human actions and organizational processes are somehow influenced from their pasts. This does not

mean all the past actions and decisions lead an organization into a dependent path. Path dependence is related with some specific concepts like sustainable permanence and being locked-in. Therefore, an organizational path dependence theory needs a detailed framework beyond past events affecting latter ones.

Liebowitz and Margolis (1995) indicate that the special importance of path dependence is related with the inefficiencies coming from the past. The existence of path dependence is determined according to being able to or not being able to overcome these inefficiencies.

Bröring, Cloutier and Jens (2006, 2008) explain the reason of path dependence as the effect of past actions on the future ones by focusing on a firm's capacity of creating new ideas. This capacity is identified by past experiences. From this point of view, path dependence means learning for future experiences by being influenced from the past ones. Schienstock (2007) also emphasizes the importance of the trajectory of change. The more this trajectory is limited, the more the future options are reduced and the organization is being led to a dependent path. According to Bröring and Leker (2007), the capacities determine the trajectories. Once a certain path is selected, the organization starts to move forward in this particular path and becomes dependent as a result of positive feedbacks of the decisions along the path.

Djelic and Quack (2007) defines path dependence as the former events affecting the latter ones. History affects the possible results and the sequences of the events. The constraints are determined by past actions and decisions. Possible first moves create a path that has deterministic effects. Once the organization enters into a certain path, a deterministic framework occurs as a result of self-reinforcing effects. The set of possible events will eventually come to an end point where the events are locked-into a certain direction.

Bruggeman (2002) points out that path dependence does not always end in negative results, however it is easier to understand its effects where it prevents adaptation to changing environmental or market conditions. Path dependence limits an organization's potential actions but it does not foresee the exact path. Once a successful path is found, positive feedbacks support learning through that path. So, success is a reinforcing mechanism.

Liebowitz and Margolis (1999) object to path dependence in their book "Winners, Losers & Microsoft". They claim that path dependence is just a myth since it is impossible to stay locked-into an inferior outcome where it is possible to shift to a superior one. They give the example of Apple against Microsoft and they say that if there was path dependence, then Apple might never have had chance to enter into

the market. When people see the superior opportunity of a product, they jump into the new path without hesitation. Wilsford and Brown (2010) are also object to defining path dependence as a theory. That claims that it is neither a model nor a theory. They define path dependence as a point of view, which explains the rational choices of an organization. Each case has its own initial conditions which makes it unique. Sensitivity to the initial conditions may not be generalized, since it is difficult to follow the transition from one condition to another.

3. Self-Reinforcing Mechanisms

As Mahoney (2000: 508) indicates: "Some path-dependent investigators define self-reinforcing mechanisms to be characterized by the formation and long-term reproduction of a given institutional pattern. Self-reinforcing mechanisms often exhibit what economists call "increasing returns." With increasing returns, an institutional pattern - once adopted - delivers increasing benefits with its continued adoption, and thus over time it becomes more and more difficult to transform the pattern or select previously available options, even if these alternative options would have been more efficient.

According to Arthur (1989), in order to define path dependence, self-reinforcement mechanisms must be in process. The more the modern and complex systems are adopted, the more the path tends to be dependent, since more experience and achievements will be gained. When there are two systems competing against each other, the result will not be decided according to strategical analysis, because the probability of random events will determine the result. One of the systems will have the advantage of being the one which has been chosen first. This system will be more and more adopted as long as it is self-reinforced by positive feedbacks. After a certain point, the organization will lose the opportunity of shifting into the other system even if the actual system no longer gives positive feedbacks.

Mahoney (2000) explains self-reinforcing mechanisms in Figure 1:

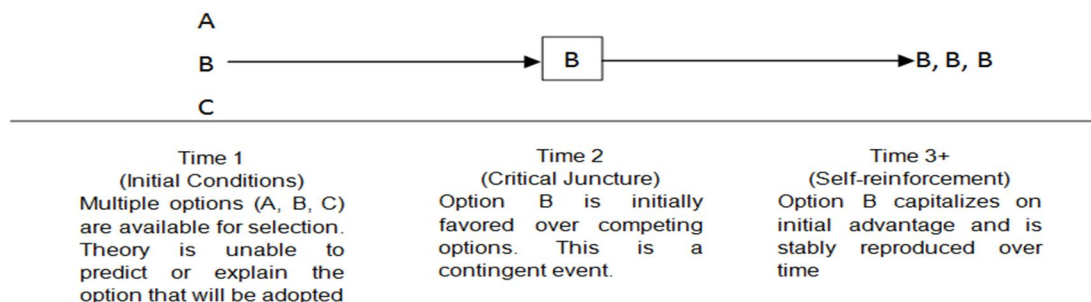


Figure 1: Self-Reinforcing Mechanisms
(Source: Mahoney, 2000: 5144)

Time 1 represents the initial conditions. During this time, there are multiple options: A, B, and C, which can be considered as different paths. They are available in order to be selected. It is not possible to predict or explain the option which will be adopted. Suppose that, option B is randomly selected over competing options in Time 2. In Time 3, if self-reinforcement mechanism come into action and positive feedbacks are achieved, then B is purposefully reproduced over time.

Sydow, Schreyögg and Koch (2009) define the effects which will contribute to the development of self-reinforcing mechanisms:

- Coordination effects
- Complementary effects
- Learning effects
- Adaptive expectation effects

3.1. Coordination Effects

The interaction among the actors of an organization becomes more efficient so long as the decision makers adopt and apply a specific system, like an organizational rule or routine. The main reason is the rule guided behavior of the actors. Rules enable the prediction of the behaviors and the reactions in advance. Costs can be significantly reduced as a result of coordination, so it becomes more attractive to adopt the rules knowing that more other individuals also follow them.

3.2. Complementary Effects

Complementary effects mean synergy. This synergy results from the interaction of separate but interrelated rules or activities. In this case, the advantages of repeatedly combining interrelated activities do not simply add up; they produce an additional excess: $T_{(x+y)} > T_{(x)} + T_{(y)}$, such as in economies of scope.

3.3. Learning Effects

When an operation is performed more frequently, the performance becomes more skillful and more efficiency will be gained. This also decreases the average costs per unit of output. This increases the attractiveness of the way of performance and decreases the preference of switching to new learning areas, where the whole process would have to start from the beginning. Continued returns will only be presumed as long as the once chosen solution is kept.

3.4. Adaptive Expectation Effects

Individual preferences are assumed to change in response to the expectations of

others, as a result of the need for social belonging and the desire to end up on the winning side. A product or service becomes more attractive as it is preferred by more people. As a result of this self-reinforcing dynamic, a dominant solution is likely to become more adapted.

4. Lock-In Mechanisms

As Sydow, Schreyögg and Koch (2009) indicate, at some point on the path, the set of options come a critical juncture where the options narrow increasingly and the outcomes become locked-into a certain path. There is no place for alternative options starting from that juncture. This is called as the lock-in mechanism and it is the main reason of path dependence. Dominant decision structure becomes stable and gains a deterministic character. Since no flexibility exists, the organization has to follow the dependent path even if there are more efficient alternative options outside the path. The system loses the ability to adapt better options, which makes it potentially inefficient.

Arthur (1989) explains the occurrence of lock-ins with four general properties:

- **Unpredictability:** In the beginning of the path, the outcomes are highly unpredictable. However, after the critical juncture, all the outcomes become fully predictable.
- **Non-ergodicity:** Historical random events may lead to lock-ins and determine the final outcome.
- **Inflexibility:** As soon as the lock-in occurs, the individuals become trapped and it becomes impossible to head towards alternative options. The system is gradually locked-into a dominant option structure.
- **Inefficiency:** The actions and outcomes resulting from the dependent path lock the individuals in inefficient options, since it becomes impossible to choose an alternative path leading to a more efficient outcome as a result of the lock-in mechanisms.

5. Organizational Path Dependence Model

Sydow, Schreyögg and Koch (2009) have designed a general model for organizational path dependence. The model consists of three phases and it is shown in Figure 2:

- Preformation phase
- Formation phase
- Lock-in phase

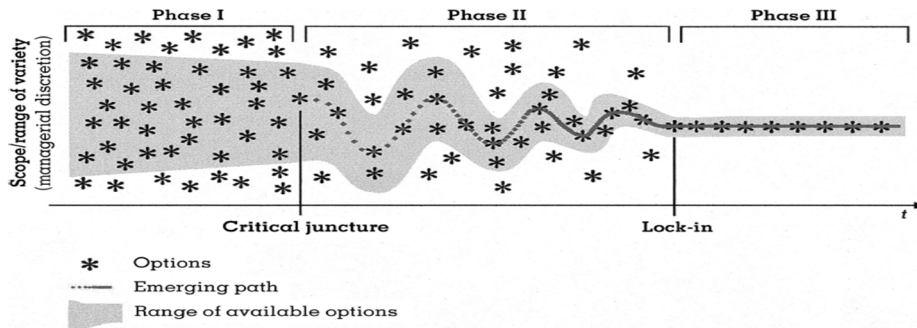


Figure 2: Configuration of an Organizational Path
(Source: Sydow, Schreyögg and Koch, 2009: 692)

5.1. Preformation phase

This is the phase where the area of alternative options is flexible, since it is not restricted. The outcome is unpredictable and efficient. The organization chooses from many alternative options. However, according to organizational capabilities, culture and history, the organization has a potential option area, which is shown as a shadow in the figure. The organization gives its decisions according to the self-reinforcements. If the feedbacks are positive, options following the path of the decision are followed. If the feedbacks are negative the organization is free to choose another alternative option. This continues until the organization comes to a critical juncture, where a self-reinforcing process leading to the organizational path dependence is activated. This becomes the end of the Preformation Phase.

5.2. Formation Phase

This phase starts with a critical juncture at the passage from Phase I to II. The scope of action is narrowed increasingly as a result of the evolving path. The decision processes are still non-ergodic, since choices are still possible. The organization still has an area of options but it is being restricted by a certain action pattern, resulting from self-reinforcements. The actions start to be reproduced over a certain period of time. A decision made or an action taken in Phase I triggers the further development of an organizational subsystem. As soon as the lock-in occurs, the formation phase ends.

5.3. Lock-in Phase

This is the phase where the system is potentially inefficient, since the area of options is inflexible and alternative courses of action are no longer feasible. The outcome becomes fully predictable. The organizational path dependence is now occurred. The dominant action pattern gains a deterministic character. As a result of

the lack of alternatives, further decisions have to replicate the path, so they are not even decisions any more. Even the new individuals are forced to adopt this particular path and continue to reproduce this particular outcome.

6. Conclusion

Factors that affect path dependence are grouped according to the literature review in Table 1-a and Table 1-b. Table 1-b is the continuation of Table 1-a. These factors will be developed and organized by content analyses in future research. Once an organizational path is developed, there will be path breaking mechanisms that force the organization with inner and / or outer pressures in order to jump into another path. These mechanisms will also be studied in detail in future research.

	Arthur (1974, 1983, 1985, 1989)	David (1985, 1986, 1994)	North (1990)	Sewell (1990)	Cowan (1991)	Krugman (1994)	Liebowitz and Margolis (1995-a, 1995-b, 1999, 2000)	Hunt and Morgan (1996)	Margolis and Mordecai (1996)	Karl (1997)
Reinforcing mechanisms, Increasing / Positive Feedback Mechanisms, Increasing Returns	x	x	x				x			
Contingency, Random events, Events that happen by chance	x	x						x		
Network effects, Network coordinations	x	x					x	x		
Initial conditions		x					x			
Deterministic Environment										
Organizational conjectures										
Absorbptive capacity	x									
Sequence of events				x						
Experimental increasing returns										
Economies of scale										
Market share economies										
Organizational learning										
Power sources effective on organizational harmonization										
Inefficiencies resulting from the past							x			
Communication		x					x			
Organizational culture, organizational heritage, organizational past, past choices		x								x
Status quo										
Organizational applications, organizational arrangements, organizational subsystems							x			
Complementary effects		x								
Industrial expectation, expectation effects	x	x					x			
Efficiency / Inefficiency	x	x				x	x	x	x	
Uncertainty	x				x					
Customer's choices	x	x					x		x	

Table 1-a: Factors affecting path dependence

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	Noteboom (1997)	Mahoney (2000)	Bruggeman (2002)	Stack and Gartland (2003)	Bröring, Cloutier and Jens (2006)	Djelic and Quack (2007)	Schienstock (2007)	Sydow, Schreyögg and Koch (2009)	Schreyögg, Sydow and Holtmann (2011)
Reinforcing mechanisms, Increasing / Positive Feedback Mechanisms, Increasing Returns			x			x		x	
Contingency, Random events, Events that happen by chance		x	x						
Network effects, Network coordinations			x						
Initial conditions								x	
Deterministic Environment						x			
Organizational conjectures								x	
Absorptive capacity					x				
Sequence of events						x			
Experimental increasing returns			x						
Economies of scale			x						
Market share economies			x						
Organizational learning			x						
Power sources effective on organizational harmonization						x			
Inefficiencies resulting from the past									
Communication									
Organizational culture, organizational heritage, organizational past, past choices	x						x	x	
Status quo								x	
Organizational applications, organizational arrangements, organizational subsystems						x		x	
Complementary effects						x		x	
Industrial expectation, expectation effects						x		x	
Efficiency / Inefficiency			x	x				x	
Uncertainty						x		x	
Customer's choices			x						x

Table 1-b: Factors affecting path dependence

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