

THE PHYSICS OF BUSINESS RELATIONSHIPS¹

Jens Geersbro

Copenhagen Business School
Birk Centerpark 40, DK-7400 Herning
Denmark
Geersbro@cbs.dk

Laurids Hedaa

Copenhagen Business School

Paul H. Schurr

State University of New York at Albany

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Abstract

According to legend, Sir Isaac Newton (1642-1727) was sitting under an apple tree when an apple fell on his head and he suddenly thought of the universal law of gravity—a theory that explains attraction between large bodies. In this paper we use such laws of physics as metaphors for understanding fundamental aspects of business relationship dynamics. Gravity, for example, evokes ideas about attraction between individuals and companies that leads to and sustains relationships. Furthermore, we think that Newton's three laws of motion together with the law of gravity and the law of entropy provide useful analogies for discussing how and why business relationships change over time. Thus, our purpose is to create a deeper understanding of actor interactions that contribute to relationship change. We build on the work of Schurr, Hedaa, and Geersbro (forthcoming) that frames interaction episodes as engines of change.

¹ The authors are listed in alphabetical order. All authors contributed equally.

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Introduction

Business relationships, although long term, stable, and durable, are not static (Halinen, Salmi, and Havila 1999 p. 784). Often relationship theorists incorrectly associate the term stability with a relationship that does not change. In connection with the concept of business relationships and networks, we believe that relationship stability refers not to the absence of change, but to effective adaptation to a changing situation (Gadde and Håkansson 1992). As activities are carried out within a business relationship, a relationship must change to promote stability. Change happens either gradually or more radically, depending on the extent that a relationship is broken or severely impacted by external or internal forces. Change is a fundamental aspect of business relationships. Without the adaptations associated with the constant activities going on within the relationship, a long-term relationship would experience unacceptable turbulence and move toward dissolution (Thorelli 1986).

Particularly in networked relationships, change is not the opposite of stability (Gadde and Håkansson 1992, Easton and Araujo 1999). However, in order to create a foundation or a context in which change can come about and profits created, managers need an element of control and predictability. Accordingly, actors in business networks act to increase their control over resources and activities (Gadde and Håkansson 1992). Thus, actors in a network strive toward predictability, and this striving provides the foundation for change in a network, as noted by Håkansson and Snehota:

“The motive for change can thus be the struggle to find stable arrangements and to experiment with workable solutions; the effect, paradoxically, is that change is generated in business networks.” (1995 p. 272)

It is in this light that we need to understand stability and change in business networks.

Various researchers suggest that change in business relationships could be conceptualised by life-cycle or stage models (Dwyer, Schurr, and Oh 1987; Ford 1980; Ford 1998; Guillet de Monthoux, Pierre B.L. 1975). We think that business relationships evolve or change over time following a life-course or life trajectory in response to the forces that are applied to them rather than a life-cycle as a result of time or age. To fully understand the trajectory of relationships over time, relationship scholars can benefit from analyzing groupings of interaction episodes that may be characterized with our physics metaphors.

Thus, our method is conceptualization, and we use anecdotal evidence to convey our theories. In the following we suggest that Newton's three Laws of Motion, Newton's Law of Gravity, and the Second Law of Thermodynamics provide useful metaphors for understanding dynamic aspects of business relationships. Newton's laws help us understand what happens to relationships when they are under the influence of net forces or when no force is applied and the Second Law of Thermodynamics helps illustrate what happens to relationships over time if left on their own.

Newton's Three Laws of Motion

Newton's first law

Newton's first law says, “Unless something exerts a force onto an object, the object will stay at rest. There is a second part to the law; an object will move at a constant speed unless a force is applied onto it”. This was in contrast to popular belief at the time which assumed that force needs to be applied to maintain a constant velocity. In our paper the first law of motion corresponds to the Law of Relationship Inertia.

Before Newton it was assumed that if an object moved it was under the influence of a net force, but Newton found that this was not so. When we often observe that objects will come to rest, it is because

there is some force exerted upon them. Typically this could be a frictional force or the force of the wind resistance.

The Law of Relationship Inertia states that relationships stay at rest or move along a straight line when not exposed to a net force. In other words “relationships keep on doing what they are doing” as long as they are not subjected to a net force.

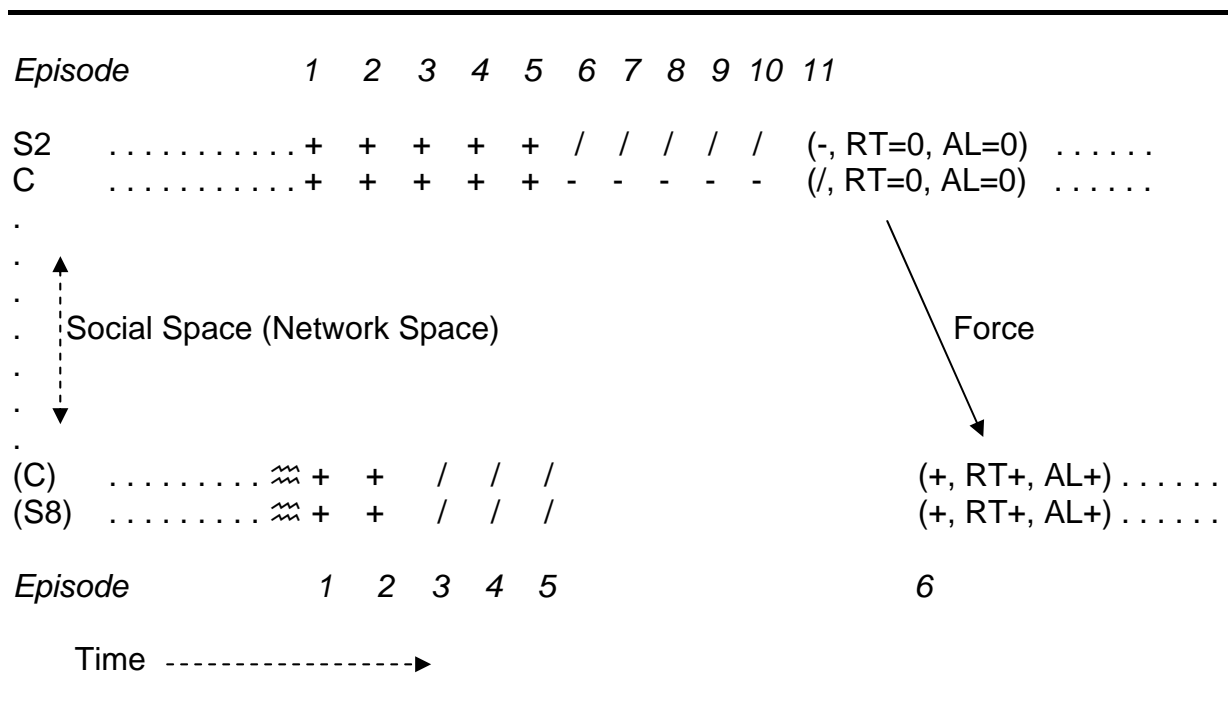
This definition raises a number of questions, which we will attempt to answer in the following. What does it mean that a relationship is “at rest” or “moving along a straight line”?

Let us first look at some trivial but illustrative examples of inertia in the physical world that we know. If we are driving in a car holding a cup of coffee, we know that if the car breaks or accelerates, the coffee in the cup will resist this change in movement. If the change in the car’s direction or speed is sufficiently large, the coffee will spill as the cup cannot keep the coffee from continuing in its path.

If we are in a car which is moving along at say 40 mph and the car suddenly stops, our body will still move at 40 mph until it is slowed down hopefully not by the steering wheel but by the seatbelt. And the opposite situation is well known as well: if the car with us in it is standing still and then starting to move forward we feel the back of the seat pushing us forward. Without the seat we would simply move backward relative to the car as it started to move forward.

The concept of relationship inertia has previously been used to describe a buyer-seller business relationship which continues or keeps on going through the motions (Bozzo 2002) either because of customer loyalty or because the customer is dependant upon the supplier (captive buyer). In the following we will extend the concept of relationship inertia to include general dynamic aspects of business relationships.

Figure 1
Interaction Episodes Showing the Law of Relationship Inertia



We start by defining a business relationship at rest as a relationship in which there are no interactions taking place and no actor bonds, resource ties, or activity links exist. Adapting Figure 4 in Schurr et al. (forthcoming), we can illustrate a relationship at rest graphically in Figure 1. The history (denoted with dotted lines) of C and S8 may include mutual awareness, but C and S8 never interacted. Their potential relationship is at rest, displaying this form of relationship inertia, as indicated by the wavy lines (≈). Perhaps customer C was satisfied with current supplier S2 and did not care to look into a relationship with S8.

If on the other hand there are interactions in the relationship, that relationship is no longer at rest. Suppose S8 decides to pursue business with C. C and S8 interact for two episodes and develop positive (+) actor bonds; the relationship changes. Then *change* ceases and we see another form of inertia. In episodes 3-5 the relationship moves in a straight line without changing, the effect on actor bonds is neutral (/). This situation corresponds to a persistent salesperson calling on a prospect without getting anywhere after the initial meetings. Thus, the other form of inertia occurs when the pattern of interactions over time is simply repeated without any change to actor bonds, resource ties or activity links, (i.e., episodes 3-5 for C and S8).

In classical physics the concept of momentum is closely related to the concept of inertia. That is, inertia refers to the nature of a mass's motion, and momentum refers to the strength of force gained by motion. Momentum is defined as an object's mass times its velocity (direction and speed). The heavier the object is and the greater its velocity, the greater its momentum or propensity to continue its movement. If an object is at rest, its velocity is zero and hence its momentum is zero even if the mass of the object is very large. And an object with only a small mass might have large momentum if it is moving very fast.

To define momentum in terms of business relationships, we need to look at the mass of a relationship and the velocity of a relationship.

We suggest that the "mass" of a business relationship is its substance i.e. the accumulated actor bonds, activity links, and resource ties (Håkansson and Snehota 1995). Over time interactions between actors potentially strengthen or weaken the bonds, ties, and links increasing the substance or the institutionalization of the relationship (Håkansson 1982).

In physics velocity is distance covered per unit of time, so the analogy to business relationships should have to do with what is achieved per unit of time. This includes two components, the rate of occurrence of interactions and the rate of change of bonds, ties, and links. Rate of change refers to how often a change occurs and how much the relationship has changed each time. Higher velocity means more frequent meetings and more positive or negative changes per meeting. A relationship has greater momentum with a higher rate of occurrence and a higher rate of change.

Therefore we suggest that the momentum of a business relationship depends on the level of institutionalization and its velocity. A relationship could have momentum in a positive direction or a negative direction. If both positive and negative changes happen frequently, a relationship may have a lot of momentum but not be going anywhere discernable.

To illustrate this line of thinking, in Figure 1, C and S2 met 6 times (i.e., a relatively high rate of occurrence) while C and S8 only were between their fifth and sixth interaction. Also, Because C was having repeated negative reactions to S2 (i.e., a high rate of change or high intensity) as a result of these interactions, the effect was substantial momentum in a negative direction—things were getting worse quickly.

Newton's second law

Newton's second law says, "An object will move with constant velocity until a force is exerted on the object". Or put in another way: to change the velocity of an object a force needs to be applied to it. Also Newton found that the acceleration, or change in velocity, is directly proportional to the force and

inversely proportional to the mass of the object. We see parallels to a Law of Relationship Acceleration.

Newton's second law addresses the situation where a net force is acting on an object. As such it applies to situations not covered by the first law, situations where the velocity of an object is changing and like the first law inferences can be made in both directions: When an object is accelerating, i.e. changing velocity, we know that there must be a net force acting upon it. And conversely, when a force is applied to an object the object must accelerate.

Previously we suggested that relationship velocity has to do with the intensity and frequency of interactions and acceleration of the relationship therefore must be changes in intensity and frequency of the relationship.

Newton found that the amount of force was equal to mass times acceleration. Given a fixed mass the larger the force the larger the acceleration and given a fixed force the larger the mass the smaller the acceleration.

Translated into a law of relationship acceleration, this means that the more institutionalized the relationship is, the more force it will take to accelerate, that is change its speed and/or direction.

In Figure 1, C and S2 terminate important aspects of their relationship, including both resource ties (RT=0) and activity links (AL=0). Thus, both RT and AL revert to a zero value. The impetus behind this relationship termination was S2's unwillingness to make investments necessary to meet C's new requirements. When C broke ties and links with S2, then S2 perceived a reduced actor bond (-) as well. The significant change in the C and S2 relationship became a force acting on the C and S8 relationship. In Figure 1 this network force is represented by an arrow. Just as the C and S2 relationship decelerates, the C and S8 relationship accelerates, as denoted by changes in bonds, ties, and links (+, RT+, AL+). Momentum builds in a positive direction.

We note that it is the net force that determines the direction and amount of change. This means that there can potentially be many different forces acting upon a relationship at the same time, and that it is the sum of all forces that matters. For managers this is potentially an important point because it implies that if a relationship does not accelerate in the expected way with regard to speed and direction, there may be forces acting upon the relationship which have not been considered in the estimate or expected forces may in fact be absent. In the previous example, C may decide to split orders between S8 and S5 (not shown), which might result in less new business than S8 expected.

Another almost classical example is illustrated by the concept of the buying centre (Webster and Wind 1972): If a firm finds it difficult to get the order for a given product, one explanation might be that there is a person blocking them in the buying centre who has not been noticed or wrongly judged. And the opposite can be true as well: an order is obtained much quicker than expected because of an unexpected influencer's role.

But a word of warning is in order. In the classical physics, the forces can simply be added together as vectors, but when it comes to business relationships it becomes a lot more complex. Different forces might interact and influence one another so that a simple sum is meaningless. Different forces might also create similar outcomes just as the same force might not always provide the same outcome depending on time and situation. However actively searching for potential forces that could be acting upon a relationship may nonetheless be very valuable for managers and researchers alike. As potential forces are contemplated so could their potential interactions be considered providing a larger repertoire of explanations and possible solutions.

Newton's third law

Newton's third law states, "Whenever one object exerts force on a second object, the second exerts an equal and opposite force on the first." We see parallels to a Relationship Law of Reciprocal Action.

In Figure 1, the broken actor bonds, resource ties, and activity links in the C and S2 relationship are exchanged for the bonds, ties, and links in the C and S8 relationship. When we speak of exchange, there does appear to be a Law of Reciprocal Action at work.

However contrary to the classical physics, business relationships are complex and therefore we cannot maintain the simplicity of Newton's third law. The force exerted by one relationship on another is not necessarily matched by an equal and opposite force. Instead we might think of different actions and reactions that may interconnect business relationships in different situations.

In the simplest situation there is no interconnection and the two relationships do not exert any force on one another. The interacts in one relationship are independent on the interacts in the other relationship. If on the other hand there are dependencies, they can be considered to be either positive or negative (Ritter 1999), and the force is unidirectional or bidirectional in contrast to Newton's third law where the force is always bidirectional. One relationship may exert a force on another relationship while the first relationship is not influenced, or the forces from the two relationships may be different in strength and direction. Or put in a different way: in business relationships reciprocity does not mean an exactly equal response. In situations where there is a response or reaction, it is likely to be far more complex. The very nature of power in relationships is that the powerful party gets others to perform acts that they would otherwise not perform—Wal-Mart's power being a well known example. Only in special situations like using Tit-for-Tat (Pruitt and Kimmel 1977) negotiation strategies, for example, can we expect to see actions met with equal reactions.

Previously we defined the force as the mass of a relationship times its velocity. Therefore the force that one relationship may exert on another relationship can be seen as depending upon the mass or the institutionalisation and the intensity and frequency of interacts in the relationship. In other words the "heavier" the relationship and the more interacts the more the potential influence of that relationship on other relationships.

Using the concept of action and reaction then leads us to consider the question of what could be the reaction from a relationship if it is influenced by a given force from another relationship. Also the question of what constitutes positively and negatively connected relationships is worth a closer look. Let us look at a couple of examples of how the relationship mass and relationship velocity works.

If a supplier's relationship with a large and important customer is expanding in volume, it is likely that the changes will affect other relationships as well. Other customers of the supplier may feel that they are getting less attention and that the large customer is driving the supplier in certain directions which are not beneficial to the smaller customers. On the other hand the fact that the large customer is expanding its business with the supplier may also be seen as a stamp of approval. It demonstrates to the smaller customers that the supplier is competent.

If on the other hand the relationship with a small customer is changed, the impact on the supplier's other customer relationships is likely to be very small or nonexistent. Only if the intensity and frequency of interactions between the small customer and the supplier are high, is it probable that it will have repercussions in other relationships. Suppliers may have small but very innovative customers which they interact with very actively which will subsequently lead to changes in other relationships where there interacts may be much less frequent and intense.

So our law of relationship reciprocity may read: business relationships which exert an influence on other business relationships will be influenced by a counter force in return which is most likely different in direction and strength and which is not synchronous in time nor necessarily in social space.

Key Findings: The Three Laws of Relationship Motion

The Law of Relationship Inertia offers insights to marketing strategy. An established relationship that persists unchanged may be analyzed more completely by considering its mass—the degree of institutionalization signified by actor bonds, resource ties, and activity links. Sellers who allow small-mass relationships to continue unchanged risk sudden deviation from the relationship's apparent path. A marketer finds a solution by building mass. A marketer creates more bonds between actors,

preferably actors in many roles, and finds new, profitable and value-laden reasons for forging new resource ties and activity links. These rate-of-change tactics give velocity to a relationship by increasing intensity, and at the same time they result in more mass (greater institutionalization).

Also, marketers can build relationship momentum by increasing the rate of occurrence of interacts, the other component of velocity. Increase the number of positive interactions per unit of time to achieve greater relational force. By building mass and increasing velocity, a marketer creates a customer relationship that stays on course. The relationship becomes more difficult to disrupt but at the same time it also becomes more difficult to manoeuvre.

The Law of Relationship Acceleration offers insight to network analysis. Where will marketers find the significant threats to a customer relationship? Threats come from exogenous actor bonds, resource ties, and activity links that offer superior satisfaction to a customer. Every business relationship is a contest to improve and expand the bonds, ties, and links that constitute relationship mass. Of course, this contest has absolutely nothing to do with absolute truths; rather, the winners depend entirely on the perceptions of the buying center members who form the relational bonds.

The Law of Reciprocal Action may seem mundane to exchange theorists who have long appreciated the role of reciprocity in human relations. However, our investigation suggests that viewing reciprocity as an equal and opposite force residing in the mass of actor bonds, resource ties, and activity links gives new insights. For instance, the more the mass of a relationship, the more potential effect it can have on other relationships. Apple Computers was a prime mover in the personal computer industry that failed to build significant market share. It took Apple over two decades to appreciate what we see as a problem of mass and relationship force. Not until March 2006 (Wikipedia 2006c) did Apple adopt the Intel processor that has been the lynch pin of the Windows-Intel-Dell market dominance. Today, Apple hardware users can run Windows at full speed without emulation work-arounds. We expect exciting industry (network) changes are now underway!

Newton's Law of Gravity and Relationship Attraction

Newton's Universal Law of Gravitation says that (Wikipedia 2006a), "Every point mass attracts every other point mass by a force directed along the line connecting the two. This force is proportional to the product of the masses and inversely proportional to the square of the distance between them." Our corresponding concept concerns relationship gravitational force, which we call the Law of Relationship Attraction:

The force of relationship attraction is proportional to actors' combined perceived net rewards from exchange and inversely proportional to their perceived distance.

Wikipedia (2006b) defines attraction as "a force that moves one object to another." While in physics attraction may result from gravity or electromagnetic force, attraction occurs in business relationships as a force experienced by human actors as a result of the desirable characteristics of a company and a company's agents. In this section we address several gaps in the literature covering business relationships:

- From an interactionist/network perspective, what is the source of attraction?
- What aspects of attraction are dynamic such that attraction causes change in a relationship?
- Can we identify critical episodes that represent turning points in a relationship based on an understanding of attraction?

Newton's Law of Universal Gravitation explains why objects have weight, why particles in space coalesce into planets and stars, and why objects in space remain in their orbits. Similarly, our Law of Relationship Attraction explains why buyers and sellers move towards each other. We discuss how buyers and sellers remain in orbit-like interdependence for a time and why relationships come apart—the notion that buyers leave one orbit or interest sphere for another (Burgess and Huston 1979, p. 79).

Net Rewards as the Source of Attraction in Business Relationships

Dwyer, Schurr, And Oh (1987) identify attraction as an important process in buyer-seller relationships,

an idea that has its roots in the social psychology of friendship and romantic relationships (e.g., Scanzoni 1979, Triandis 1977, pp. 164-193). Thibaut and Kelley (1959; see also Secord and Backman 1974) propose that attraction arises out of interaction that achieves a net positive outcome from the tally of rewards and costs. The IMP Group (Håkansson 1982) similarly speaks of motives, both social and economic, and suggests that both social and economic rewards and costs influence actors to enter into business relationships. Various scholars discuss the specific nature of rewards and costs in business (e.g., John 1984, Lott and Lott 1974). Human motivation for social and economic net rewards gives direction to behavior in business just as gravity gives direction to objects.

The interactionist-network perspective of the IMP Group clarifies how businesses connect into business relationships. Specifically, in business relationships actor bonds, resource ties, and activity links—the three components of the ARA model (Håkansson and Snehota 1995)—represent three categories of exchange and commitment. We propose that the ARA model also suggests the sources of rewards and costs in business relationships, but only to the extent we can connect it to human actors.

Actor bonds. First, actor bonds, which are necessary for cooperation and commitment, arise because actors are individuals in social relationships. Survival in a social matrix requires that we bond with members who can help us obtain essential resources. Employees create bonds in behalf of their company as agents, but also for personal satisfactions. Psychologist Robert Cialdini (1993), an expert on influence, says that personal social rewards arise from satisfactions associated with another party's physical attractiveness, similarities, affinity, familiarity, contact, cooperation, and simply enjoying that "someone fancies us" (p. 174). With respect to interaction behaviors, Triandis (1977, p. 45) says that rewards and costs depend on "(1) the behavior it self, (2) the perceived causes of the behavior, (3) the expectations of the perceiver, and (4) the needs of the recipient." Actors experience costs as a result of behaviors such as hostility, ignoring, suspicion, rebuff, noninvolvement, and rejection.

Resource ties and activity links. Indirect rewards make resource ties and activity links the source of attraction between companies. Companies may have the legal rights of individuals in that, for example, they own things, they buy things, and they sue others; however, without actors companies have no motivations. Humans feel attraction for rewards and feel motivation to forge connections between companies. Therefore, the force of business-to-business attraction resides in the perceptions and beliefs of human actors—a fact that scholars lose in the course of building elaborate theories about business exchange. Motivational drive originates with actors, especially the collective perceptions and beliefs of actors in a network. Little occurs between companies without human actors who communicate and take action by making resource commitments and establishing activity links. Thus, attraction associated with resource ties and activity links—certainly a source of relationship value—resides in actors.

Resource ties and activity links connect companies in a business relationship and, when commercially fruitful, produce rewards for stakeholders and organizational actors. Because agent-actors orchestrate these resource ties and activity links, they receive economic rewards for successes and costs for failures as a result of their company roles that cause them to act in behalf of their employer. Likewise, stakeholder-actors, not the least of which are customers and investors, are motivated by economic rewards and represent another source of intercompany attraction. Thus, resource ties and activity links produce rewards and costs for human actors who are the instrument of attraction between companies.

Actors feel attraction in business relationships resulting from intrinsic and extrinsic sources. For example, a salesperson gets a commission by closing a sale, an economic reward. An entrepreneur gets psychic (intrinsic) rewards from successfully finding distribution partners in an untapped market. A general manager gets a substantial promotion by successfully implementing an automatic reordering system with retail outlets. A purchasing agent gets personal satisfaction by buying from a salesperson he likes. From this viewpoint, intercompany attraction is surprisingly complicated and obfuscated. A measure of, say, relationship quality, seems destined for failure as a reliable predictor of whether or not a business relationship will last.

Cialdini (1993) persuasively demonstrates that the force of attraction often bears no relationship to conscious, rational tallies of costs and rewards. For example, physically attractive individuals are better liked, more persuasive, and in other ways given various social advantages. Further, attractive people have a halo effect that makes proposals, products, and companies more attractive. In other

words, attraction derives from perceptions that may be biased, inaccurate, and manipulated. We can never be sure that a reward to one person also represents a reward to another.

Our conclusion about attraction is this: attraction resides entirely with actors and their perceptions. Therefore, in Figure 1, each interaction potentially changes attraction directly because of changes in actor bonds or indirectly because of changes in resource ties and activity links. The C and S2 relationship shows declining attraction and relationship dissolution, while the C and S8 relationship shows increasing attraction and a commitment critical event (a positive change in resource ties and activity links).

Other Forces that Pull Businesses into an Undesirable Relationship

Although attraction holds relationships together, sometimes relationships are held together by forces other than attraction—in the way that dependent children, switching costs, and the force of religious beliefs sometimes hold together marriages. Actors can forge legal obligations between their company and other companies. Such obligations may keep companies in an unwanted relationship by force of law. Also, third parties, especially governments (and crime syndicates, perhaps), may obligate companies to conduct business in a relationship where costs exceed rewards by virtue of the third party's political power, legal force, or even physical force. Actors may commit resources to another company such that transaction costs make changing partners unrealistic by force of economics. Finally, in the absence of alternatives, a company may stay in a relationship in which costs exceed rewards by virtue of market forces (Thibaut and Kelly 1959, Williamson 1981).

These factors appear to be exceptions to our Law of Relationship Attraction. Inconvenient exceptions to Newton's Law of Gravitational Force caused Einstein to invent the Theory of Relativity. The Theory of Relativity says there is no gravitational force; rather, space-time changes shape around an object with mass, causing the appearance of gravitational effects. We note that attraction is not the only force that holds companies in a relationship, merely the positive force—although Thibaut and Kelly (1959) offer an interesting starting point for a theory of relationship relativity!

Distance in a Relationship

The Law of Relationship Attraction asserts that the force of relationship attraction is inversely proportional to perceived distance. Distance refers to attributes in the business context that cause actors to feel separated. Perceived distance has not been thoroughly studied with respect to attraction, but many scholars have discussed contextual influences on business relationships (Achrol, Reve and Stern 1983; Anderson and Weitz 1986; Håkansson, Håkan 1982; Hallen, Johanson and Seyed-Mohamed 1991; Heide and John 1988).

Distance between actors may be caused by spatial, social, and psychological factors, including geography, time, culture, social status, role, age and other personal characteristics, and culture-based perceptions, such as stereotyping (Ford 1980; Håkansson Snehota 1995; Triandis 1977). Technology reduces the effects of distance, but not for all exchange situations. For example, communication technology, such as email, instant messaging, and Web-based audio-visual conferencing, facilitate human and business exchange, but each technology has limiting characteristics (Schurr, Chengalur-Smith, and Pazer 2002).

Businesses understand the effects of distance. To combat unfavorable not-made-here perceptions (not to mention shipping costs), Toyota now operates 12 North American vehicle manufacturing, powertrain, and component plants and has manufactured over 15 million vehicles in North America (Autoblog 2006). Toyota's manufacturing strategy has roots in labor union concerns as well as retail customer perceptions.

Attraction Causes Change in a Relationship

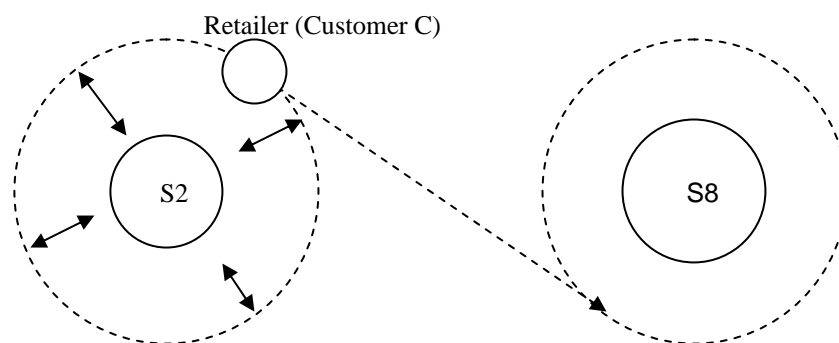
The value of understanding attraction derives from its influence on relationships. We think in terms of motion—a change in attraction moves a buyer and seller either closer together or farther apart. This idea comes from Newton's law of universal gravitation. Newton's Law says that objects accelerate toward each other, that is are attracted to each other, in proportion to their mass. If you drop your pen, it falls to the earth. Surprisingly, the earth also falls toward the pen! However, because the mass of

each object is so different, the earth's movement toward the pen is infinitesimally small.

Similarly, two companies move toward or away from each other as a function of attraction. For example, a small retail store may be very attracted to a supplier with a strong brand name that draws customers into the store. The brand name has mass based on resource ties (perceived satisfactions) and activity links (exchange behavior) with consumers that the retailer also wants to attract. However, the supplier may see the retail store as an insignificant link in its distribution network. In this case, the retailer figuratively moves toward the supplier, but not *vice versa*. Another way we might see this is that the retailer is more dependent on the supplier much like the earth revolves around the sun instead of the sun revolving around the earth.

If we picture the orbit metaphor for business relationships, the supplier (S2 from Figure 1) and retailer (C from Figure 1) might be represented as in Figure 2. Just as the earth revolves around the sun, the small retail store revolves around the anchor brand. Asymmetries in attraction give apparent power to the entity with greater mass; for instance, the sun will never revolve around the earth. Similarly, the strong brand has power over the retail outlet that has less force of attraction. However, another supplier (S8 in Figure 1) attracts the retailer as well, and S2 may pull the retailer from S2's orbit by virtue of a stronger force of attraction. Although many businesses tend to have enduring relationships, we frequently see businesses change orbits as the forces of attraction change.

Figure 2
Retailer Changing Orbit



Three Sources of Change in Attraction

We need to understand the sources of change in order to identify critical interaction episodes where a relationship strengthens to a new level or suffers a decline. Three sources of changes in attraction include:

- Changes in compared rewards by virtue of changes in the true value of rewards or changes in the availability of alternatives
- Changes in perceived net rewards
- Changes in the number and roles of actors experiencing motivation from rewards

Changes in compared true values of rewards. Using Thibaut and Kelly's (1959) comparison level of alternatives concept (CL_{alt}), the attraction of a buyer to a seller depends on what other seller relationships are available. Thus relationship change occurs when net reward comparisons become unfavorable. On the other hand, winning a supplier from a competitor depends on the reverse. We can think of a buyer always being in motion. A buyer's needs change as markets and other aspects of the business environment change. The buyer's motion makes a relationship, or at least the reward and cost structure, a moving target requiring continuous adaptation by a supplier. The supplier of must strive to keep relative net rewards more favorable than the competition.

Critical interaction episodes may be recognized when actors conclude that comparison levels have changed as a result of increasing or decreasing net rewards, changes in market alternatives, or changes in switching costs. Doubtlessly many of these critical episodes arise from network

connections as when a customer's customers evidence changing preference structures or when a new supply alternative enters the picture. However, a change in buyer needs or a change in supplied benefits signal a change in the true value of net rewards.

We note that increases in net rewards have diminishing marginal utility, suggesting that there is only so much a supplier can do to make its products and services attractive to a customer. Nevertheless, net rewards stimulate attraction, and over some range, increases in the true value of net rewards can increase attraction.

Changes in perceptions. Rather than a change in the true value of rewards a change in perceptions about the true value represents a second source of change in attraction. Buyer-seller interactions evidence criticality when actors fail on some level to understand messages about buyer needs or seller benefits or, more favorably, when participants gain insights to needs or benefits. Consider Table 1 in which suggests a customer's attraction states for the seller. Assume that the relational distance factor is held constant. Relationship attraction for the seller achieves full force only when the customer accurately perceives true high net rewards, the upper left-hand cell. Unwarranted perceptions of high rewards await discovery and subsequent disenchantment—a significant interaction episode. The opposite may occur when inaccurate perceptions are corrected and actual net rewards are high. Of course, the picture is much more complicated than this, because a seller, too, may have accurate or inaccurate perceptions of net rewards from conducting business with a customer.

Buyers and sellers try to influence each other's perceptions. While sellers use advertising, personal selling, and other communication techniques, business customers have more limited budgets and tactics. Proactive strategies aimed at elevating a buyer's standing with a supplier become essential when supplies are limited or when a supplier appears reluctant to devote resources to a buyer.

Table 1
The Influence of Perceived Rewards on Attraction

		Actual Net Rewards	
		High	Low
Accuracy of Perceived Net Rewards	High	High Attraction	Eventual Disenchantment
	Low	Unrealized Attraction	No Attraction

Changes in the number of actors and roles of actors. Finally, Changes in the number and roles of actors experiencing motivation from rewards will change a relationship. A classic and well understood critical interaction episode occurs when a key contact leaves a client company. The newcomer always represents a threat of change for the sake of change and the need to show evidence of productive action. How many advertising agencies have lost customers this way? Generally speaking, a critical event occurs whenever a different actor takes on a role that connects a buyer and seller because that new actor will perceive net rewards in their own unique way. Business relationships rest on human perceptions and motivations, not objective truths about attraction.

Critical events occur whenever another influential member of a customer's buying center gains understanding and appreciation for net rewards from a supplier. A larger the number of actors feeling attraction causes the force of attraction to become stronger and more stable. The very number of actors feeling attraction for a business partner reduces the vulnerability of the relationship to change caused by a single point of contact. When more actors in a variety of roles feel attraction, then the relationship is pulled by a larger range of interests.

Key Findings: The Law of Relationship Attraction

Our exploration reinforces the importance salespeople place on building personal relationships in sales encounters because actor bonds are the primary source of attraction. Our perspective on attraction adds that a greater number of personal relationships makes attraction stronger. When team selling and a network of interpersonal relationships can be cost justified, the effort is certainly warranted. To fully realize the profit from building interpersonal relationships, the sales effort must regularly assess perceptions of relationship benefits. Often companies think this assessment should be objective, focusing on resource ties and activity links. However, actor bonds are the root source of attraction and probably an important starting point for conflict in business relationships and eventual dissolution. Doubtlessly unrealized expectations can hurt a relationship, but we suspect that actor bonds play a larger role than the current research literature suggests.

The importance of mass in attraction—the accumulated actor bonds, resource ties, and activity links—suggests that more marketing strategy might focus in this direction. Relationship management for important accounts requires active creation and maintenance of bonds, ties, and links.

Is Attraction Worthy of More Study?

Attraction is central to the larger theory of business relationships because attraction, trust, and commitment are closely related. Commitment concerns an agreement to connect two companies in a commercial relationship. Commitment requires trust (Morgan and Hunt 1994), particularly in the often complicated and enduring relationships between businesses (Håkansson 1982). The desire for trust stems from an actor's perceived risk that expected rewards and costs—the root of attraction and the driver of a relationship—may not be realized. Trust counterbalances risk inherent in the unpredictable future that holds a promise of rewards. Thus, attraction is an essential aspect of relationship theory and one that deserves more attention. The sources of net rewards, distance, and an interactionist-network perspective on change caused by attraction offer useful avenues for study.

The Second Law of Thermodynamics

The second law of thermodynamics says: "the world constantly deteriorates from differentiated complex forms to homogenous chaos." Schurr, Hedaa, and Geersbro (forthcoming) introduced the Law of Relationship Entropy. In the following we expand this concept and we use the empirical work of Lars Mikkelsen to illustrate how relationship quality deteriorates over time.

Thorelli (1986, p.43) comments on the idea that networks over time grow stronger, "in the sense of moving from loose to tight, from poor internal fit to greater degrees of integration". He questions this notion's general validity and goes on: "Rather, it would seem that in the absence of conscious coordinative effort – why not call it network management? – networks would tend to disintegrate under the impact of entropy."

Relationships usually are established by mutual attraction and selection. One part can not select another part if the other part – under norms of free choice - does not want to be selected. It takes resources to establish relationships, i.e. time and effort. Once established, it takes resources to develop and maintain relationships, what Thorelli denotes coordinative effort. Establishment, development, and maintenance are processes. They may go somewhat like this:

Signal → Attention → Response → Exchange → Mutual understanding → Mutual benefit.

Each element in the process takes behavioural and cognitive energy. So, if the energy supply stops in any of the process elements, the relationship deteriorates.

Informed by the German scientist Rudolph Clausius, who was one of the early contributors to thermodynamics, and who coined the term Entropy, Hedaa (1987) and Schurr, Hedaa & Geersbro (forthcoming) formulated the following Law of Relationship Entropy assuming system character in supplier-customer relationships:

- “Because of relationship-exogenous changes and events, a supplier will experience a declining sense and understanding of the customer’s needs and wants (though this experience may not be perceived).
- Because of relationship-endogenous mistakes, misunderstandings and unforeseen events, relationship quality is continuously breaking down.
- The only means to remedy entropy is to induce resources (energy) into the relationships.

The lesson is that to transform relationship contents from worse to better takes effort, and complacency leads to relationship deterioration and dissolution.

Entropy is a measure of the disorder present in a system. Entropy points to the fact that a system left to itself will descend into chaos. For business relationships this means that if energy is not applied to the relationship it will eventually dissolve. The Law of Relationship Inertia proposed previously states that a relationship not under the influence of any net force will either be at rest or continue moving along a straight line; in addition the Law of Entropy says that even so, the relationship will dissolve over time if left alone. This can be illustrated using the nomenclature from before as in Table 2.

Table 2
Relationship Entropy Over Time

Actors	Relationship Bonds, Ties, & Links Prior to Time Period 0	Time Period 1	Time Period 2	Time Period 3	Ending Relationship Bonds, Ties, & Links
Actor 1 Seller	+, RT=+, AL=+				0, RT=0, AL=0
Actor 2 Buyer	+, RT=+, AL=+				0, RT=0, AL=0

From the second law of thermodynamics we learn that all types of energy spontaneously spread out from where they are localized to where they are more dispersed, if and only if they are not impeded from doing so.

The energy bound in handling one relationship cannot be used in other relationships. The more of your total pool of energy you apply to one relationship, the less energy is left to tend to other relationships. We have a limited relationship capacity. Therefore, we are faced with the fundamental choice of having a large portfolio of superficial relationships, or a small portfolio of deep relationships, or any combination within the confines of our capacity.

Recent trends toward reduction of companies’ supplier bases point to a cooperative strategy where mutual adaptations and exploitation of complementary skills and resources are assumed to add more net benefits to involved parties. This requires deeper relationships.

The Law of Relationship Entropy is confirmed in a recent study of 34 dyadic relationships between kitchen manufacturers and cabinet door suppliers (Mikkelsen, forthcoming). Partners’ perceived match between mutual expectations and performance is inversely related to age of relationships. Buyers and sellers grow apart over time and seem to have the best relationship fit in the early years of the relationship life course.

One set of explanations may stem from an initial tendency in new relationships to invest in developing rules and routines for fruitful dialog, establishing mutually acceptable behavioural norms, in short building structure and context for efficient interactions.

However, once you have created a mutually oriented structure and context for efficient exchange, you have also introduced contextual stasis—a diminishing flow of energy into the relationship. A straight

repeat purchase takes less energy than a new-task first purchase. Since investments in context for interaction free your attention from structure so you can spend more energy on other things, you also tend to take things for granted. Over time, changes in preferred action embedded in old structures lead to increasing relational misfit.

Key Findings: The Law of Relationship Entropy

Relationship entropy is an insidious process, a patient enemy of durable relationships. Timely and continued investments in relational structures and mutual adaptations stem the tide of entropy. The very point at which a relationship becomes structured signals a time when a relationship tends toward decline as energy diverts elsewhere. Entropy is not random, but fostered by structured buyer-seller interaction that puts a relationship on autopilot. Engaging a buyer in problem solving, process improvement, and business development may reverse entropy.

Summary

Relationships are dynamic and subject to forces that businesses cannot escape. Building on, and adding to, the growing body of investigation and discussion concerned with dynamic relationships, we have used the modelling techniques and approach of Schurr, Hedaa, and Geersbro (forthcoming) to elaborate on fundamental patterns of relationship change that we convey through the metaphor of relationship physics. In doing so we have suggested that there are valuable insights to be gained by using a physics metaphor, but we have also suggested that one should be careful in applying such a metaphor. Inferences that may seem straight forward and logical may not hold because the concepts are no longer applied to the deterministic environment of natural science but rather to a highly complex social world.

This paper contributes in two primary areas. First it identifies significant patterns of relationship change that can be categorized using our metaphor of relationship physics. Second, it maps typical interaction episode sequences that illustrate critical episodes in relationship dynamics. We believe this second contribution provides an essential foundation for both practice and investigation.

Reference List

- Autoblog (2006), "Toyota Builds 15 Millionth Vehicle in North America," (February 3rd), (accessed April 8, 2006), [available at <http://www.autoblog.com/2006/02/03/toyota-builds-15-millionth-vehicle-in-north-america/>].
- Achrol, Ravi S, Torger Reve and Louis W. Stern (1983), "The Environment of Marketing Channel Dyads: A Framework for Comparative Analysis", *Journal of Marketing*, 47 (Fall), 55-67.
- Anderson, Erin and Barton A. Weitz (1986), "Make-or-Buy Decisions: Vertical Integration and Marketing Productivity", *Sloan Management Review*, (Spring), 3-19.
- Bozzo, Ceclie (2002), "Understanding Inertia in an Industrial Context," *IMP 2002 Conference*, Dijon, France
- Burgess, Robert L. and Ted L. Huston (1979), *Social Exchange in Developing Relationships*, New York: Academic Press.
- Cialdini, Robert B. (1993), *Influence The Psychology of Persuasion*. New York: Quill, pp. 167-207.
- Cox, Revis, Wroe Alderson, Stanley J. Shapiro (1964), *Theory in Marketing*. Homewood, IL: Irwin.
- Dwyer, F. R., Paul H. Schurr, and Sejo Oh (1987), "Developing Buyer-Seller Relationships", *Journal of Marketing*, 51 (2), 11-27.
- Easton, Geoffrey and Luis Araujo (1999), "Discontinuity in Networks: Issues and Initiatives as Initiators," in *International Marketing and Purchasing*, Pervez N. Ghauri, ed. JAI Press Inc, 91-108.
- Ford, David (1980), "The Development of Buyer-Seller Relationships in Industrial Markets", *European Journal of Marketing*, 14 (5/6), 339-54.
- (1998), "Two Decades of Interaction, Relationships and Networks," in *Network Dynamics in Interorganizational Marketing*, Peter Naudé and Peter W. Turnbull, eds. Oxford: Pergamon, 3-15.
- Gadde, Lars-Erik and Håkan Håkansson (1992), "Analysing Change and Stability in Distribution Channels - a Network Approach," in *Industrial Networks: A New View of Reality*, Björn Axelsson and Geoff Easton, eds. London: Routledge, 166-179.
- Guillet de Monthoux, Pierre B.L. (1975), "Organizational Mating and Industrial Marketing Conservatism - some Reasons Why Industrial Marketing Managers Resist Marketing Theory", *Industrial Marketing Management*, 4 (1), 25
- Halinen, Aino, Asti Salmi, and Virpi Havila (1999), "From Dyadic Change to Changing Business Networks: An Analytical Framework", *Journal of Management Studies*, 36 (6), 779-94.
- Hallen, Lars, Jan Johanson and Nazeem Seyed-Mohamed (1991), "Interfirm Adaptation in Business Relationships", *Journal of Marketing*, 55 (April), 29-37
- Hedaa, Laurids (1997), "Industriel markedsføring i netværk" in Laurids Hedaa & Nicolai Foos (eds): *Afsætning og Samarbejde*. Copenhagen: Handelshøjskolens Forlag.
- Heide, Jan B and George John (1988), "The Role of Dependence Balancing in Safeguarding Transaction-Specific Assets in Conventional Channels", *Journal of Marketing*, 52 (January), 20-35.
- Håkansson, Håkan (ed.) (1982), *International Marketing and Purchasing of Industrial Goods. an Interaction Approach*. Chichester: John Wiley.

- and Ivan Snehota (1995), *Developing Relationships in Business Networks*. London: Routledge.
- John, George (1984) "An Empirical Investigation of Some Antecedents of Opportunism in a Marketing Channel," *Journal of Marketing Research*, 21 (August), 278-89.
- Lott, Albert J. and Bernice E. Lott (1974), "The Role of Reward in the Formation of Positive Interpersonal Attitudes," in *Foundation of Interpersonal Attraction*, T. L. Huston, ed. New York: Academic Press.
- Mikkelsen, Lars Bjerregaard (forthcoming).in search of a recipe. Unpublished dissertation draft. CBS-CAMS Herning.
- Morgan, Robert M. and Shelby D. Hunt, (1994), "The Commitment-Trust Theory Of Relationship Marketing," *Journal of Marketing*, 58 (July), 20-38.
- Pruitt, D. G., and M. J. Kimmel (1977). "Twenty Years of Experimental Gaming: Critique, Synthesis, and Suggestions for the Future," *Annual Review of Psychology*, 28, 363-392.
- Ritter, Thomas (2000), "A Framework for Analyzing Interconnectedness of Relationships", *Industrial Marketing Management*, 29 (4), 317-26.
- Scanzoni, J. (1979), "Social Exchange and Behavior Interdependence," in *Social Exchange in Developing Relationships*, R. L. Burgess and T. L. Huston, eds. New York: Academic Press.
- Schurr, Paul H., Laurids Hedaa, and Jens Geersbro (forthcoming), "Interaction Episodes As Engines of Change", *Journal of Business Research*.
- , InduShobha N. Chengalur-Smith, and Harry L .Pazer (2002), Information Quality and Online B2B Relationships, *Journal of Customer Behaviour*, 1, 87-101.
- Secord, Paul F. and Carl W. Backman (1974), *Social Psychology*, 2nd ed. New York: McGraw-Hill.
- Thibaut, J. W., and H. H. Kelley (1959), *The Social Psychology of Groups*, New York: Wiley.
- Thorelli, H. B. (1986), "Networks: Between Markets and Hierarchies", *Strategic Management Journal*, 7 (1), 37-51.
- Triandis, Harry C. (1977), *Interpersonal Behavior*, Monterey, CA: Brooks/Cole.
- Wikipedia (2006a), "Newton's Law of Universal Gravitation," (accessed April 7, 2006), [available at http://en.wikipedia.org/wiki/Newton%27s_law_of_gravity].
- (2006b), "Attraction," (accessed April 7, 2006), [available at <http://en.wikipedia.org/wiki/Attraction>].
- (2006c), "Apple Computer," (accessed March 16), [available at http://en.wikipedia.org/wiki/Apple_Computers].
- Williamson, Oliver E. (1981), "The Economics of Organizations: the Transaction Cost Approach," *American Journal of Sociology*, 87 (3), 548-77.