The Pace or the Path? Resource Accumulation Strategies in the U.S. Airline Industry

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Abstract: *In the well documented case of the early low-fare and no-frills carrier "People Express Airlines" the common explanation for the rapid rise and decline is excessive corporate growth. Based on a dynamic resource-based view, this paper finds that it is not only the pace but the path of growth—embodied in the resource accumulation processes—which determines the outcome of a corporate growth strategy. In comparison to "Southwest Airlines"—the prototype of nearly all nowadays low-fare and no-frills carriers—People Express' strategy did differ in the speed of corporate growth and in other vital strategic decisions, e.g. implementing a hub and spoke network and giving service to heavy congested major airports instead of flying to secondary airports in a loose coupled point to point system.*

The U.S. Airline Industry after the Deregulation

Dealing with dynamic systems, people find it difficult to ascertain the implications of strategic decisions. Due to complexity, which is a function of connectivity, functionality and variety of the system elements (Milling 2002), people tend to chose the most apparent explanation for a system's behaviour. In the case of "People Express Airlines" (PE), the most apparent explanation for its rapid decline is vast corporate growth:

Starting service on April 1981 with three B-737s and three destinations, PE became the fifth biggest U.S. airline in 1986, with nearly one million passengers per month. Only one year later, however, PE was facing bankruptcy and was finally sold to "Texas International Airlines" (Beer 1990; Schlesinger and Whitestone 1983). Since service and reliability of PE did worsen constantly, customers did even call PE "People Distress". In comparison to PE, "Southwest Airlines" (SW) has grown since its incorporation in 1971 constantly to become the fourth biggest U.S. airline and serves as a role model for nearly all nowadays low-fare and no-frills carriers (Freiberg, Freiberg, and Peters 1996; Heskett and Hallowell 1997). In addition until today, SW is the only U.S. airline which has shown constant profitable performance, even through the dramatic years 2001 to 2003, and was able to win 30 times the "triple crown" for the fewest passenger complaints, delays and lost baggage in a month. The obvious explanation for the different behaviour is the significant higher rate of grow of PE in comparison to SW (see table 1 for growth rates and other comparative data), but this explanation neglects other differences between the two carriers. Unlike PE, which implemented a hub and spoke network and offered even intercontinental flights like the major airlines, SW abided with its primal loose-coupled point to point, short-haul, and domestic network. Nowadays, it still is the only major airline in the U.S. without a hub and spoke network.[1]

After the "Airline Deregulation Act of 1978", which was the signal for several different approaches in the U.S. airline industry, a new "strategic group" (Porter 1980) of air carriers emerged, whose common marketing strategy was to offer low-fare and no-frills air service. Beside that commonality—at least in the early years after the deregulation—the low-cost airlines followed quite different corporate growth strategies and experienced different outcomes.

	People Express (1981–1986)			Southwest Airlines (1983–1988)		
	Mean	Variance	Maximum	Mean	Variance	Maximum
growth of cities served	39.70%	7.304%	65.00%	6.22%	0.003%	7.05%
growth of fleet size	43.29%	17.42%	100.00%	13.63%	1.24%	29.63%
aircrafts per city served	1.61	0.11	2.0	2.2	0.1	2.5
growth of available seat miles (ASM)	106.22%	110.20%	268.80%	16.59%	0.97%	26.23%
growth of passengers carried	72.66%	70.29%	197.79%	9.54%	0.50%	18.26%
growth of revenue passengers miles (RPM)	110.48%	132.19%	284.82%	17.32%	1.07%	36.56%
average load factor	63.87%	0.45%	74.60%	59.23%	0.02%	61.60%
average anual break even load factor	67.92%	0.27%	72.83%	57.84%	0.31%	66.10%
average costs per ASM	¢ 5.62	¢ 0.0029	¢ 6.7	¢ 6.21	¢ 0.0018	¢ 7
average yield per RPM	¢ 8.28	¢ 0.0046	¢ 9.2	¢ 10.77	¢ 0.0015	¢ 11.13
growth of total employees	49.88%	36.26%	119.65%	14.00%	1.98%	37.47%
growth of full time emplyees	49.91%	48.67%	154.51%	13.12%	1.62%	32.56%
growth of part time emplyees	60.27%	55.53%	152.50%	36.87%	46.04%	132.06%
total employees per aircraft	82	332	106	72.7	39.0	77.7
full-time employees per aircraft	51	94	65	67.5	25.7	71.2

Table 1: Data for People Express and Southwest Airlines

Beside the new-founded low-fare airlines, the other attempts can be summarized with the catchword "airline within an airline": In order to give an appropriate answer to the emerging threat of pure low-cost carriers like PE and SW, the major airlines tried to copy that approach by creating special low-fare divisions within their corporations, which could act as quasi-independent airlines. However, beside this marketing strategy, those low-cost divisions could not really act independently. They were bonded to the corporate hub and spoke networks, to achieve high economies of scale on corporate investments, e.g. airport gates, maintenance crews and other equipment, and to provide high connectivity to the full-service flights of the corporation. E.g. in the extreme case of "United Airlines", its low-fare division "Shuttle" did only serve as a feeder on the spoke routes. Some of these divisions even competed with its mother airlines, like "Continental Lite" that gave service to the same relations as "Continental Airlines".

Although some of the airline within an airline attempts were quite promising, they all lacked cost-efficiency, productivity and could not offer the same degree of service as SW, even those who did grow far more slowly than SW. Anyway, in comparison to the major airlines as a whole, SW showed a tremendous growth in available seat miles (16 versus 5%, see table 1 and Inkpen and DeGroot 2002). At first glance, the disadvantage in effectiveness is a paradox finding, since hub and spoke network layouts are considered to be the only cost-efficient way to offer a great variety of nationwide and intercontinental flights with a high number of destinations by a single airline

(Doganis 1991), and therefore have been implemented by all major airlines around the world. In contrast, some low-fare carriers, like “Morris Air”, showed prosperous outcomes. “Morris Air”, founded by a former SW vice president, implemented a point to point network, gave service to secondary airports and applied only one type of aircraft, like SW, to reduce maintenance and training costs. SW bought up “Morris Air” in 1992 and thereby made its only acquisition in its firm history of over thirty years.

The examples described above indicate that differences in the pace of growth might not be the only reason for the varying outcomes of the low-cost approaches in the U.S. airline industry, since the experiences regarding the coherence between rate of growth and corporate success are mixed. It seams that the path of growth, i.e. the type of network, airports etc., have to been taken into account to give an appropriate answer to the question, why some promising corporate business attempts—like that of PE—fail and why a quite similar structured firm—like SW—can become the role model for an entire strategic group. From a market-based view, the different outcomes are not really explicable, especially considering the comparatively poor performance of the airline within an airline approaches, as textbooks claim such divisional corporations to be highly efficient (Porter 1980). However, for the aim of this paper, i.e. to analyse processes of corporate growth, the resource-based view of the firm (RBV, Wernerfelt 1984) is a more appropriate method, as its development is a reaction to the poor contributions market-based theories can offer to explain the occurrence of corporate growth in general (Penrose 1959).[2]

The next chapter gives a brief overview of the RBV and its dynamic adaptation. The latter aspect is not trivial, as the RBV has to be “dynamized” in order to analyse processes of corporate growth. This dynamic RBV serves as the theoretical basis for a generic model of a low-fare airline, which will be presented in the section after the next chapter. The aim of the model is to simulate and to compare different strategies of corporate growth. The model is generic, as it represents either SW or PE in each of the firm-specific parameter sets. This paper ends with conclusions and comments on further work.

Applying a Dynamic Resource-based View

Resources can be accounted as “stocks of available [tangible and/or intangible] factors that are owned and controlled by a firm” (Amit and Schoemaker 1993). In this regard, a resource is something that a firm possess resp. has reliable access to. E.g. the participation in computerized booking systems like SABRE or APOLLO can be considered as resources, even though they are not possessed by a participating airline. Other examples for valuable resources in the airline industry are aircrafts, staff, reputation, employee morale and airports (Morecroft 1997). The criteria, if a certain resource is tangible or not, does not specify the value of that asset, *per se*. Basically every resource can be valuable to a firm. E.g. an aircraft does inherently exhibit a value. However, it is not very likely that the ability of a firm to sustain successful depends single resources. If one takes a deeper view on “Wall Mart”, it strikes that its often cited “core competence” (Prahalad and Hamel 1990) in logistics does generally consist of resources, like an elaborated cross-docking system with a company-owned fleet of trucks, aircrafts, satellite-communication, close supplier-relationships and a human resource system, which is capable to adjust staff shortly up to 25% (Stalk, Evans, and Shulman 1992), just to name the most apparent assets. Howsoever, it appears very improbable that such valuable assets can be acquired over “strategic factor markets”, as some scholars of the RBV suggest (Barney 1986; Grant 1991). Thus it is more likely that such resources of strategic importance have to be accumulated within the firm, in order to achieve a firm-specific and valuable resource profile (Dierickx and Cool 1989). In this paper these resources are called "strategic assets".

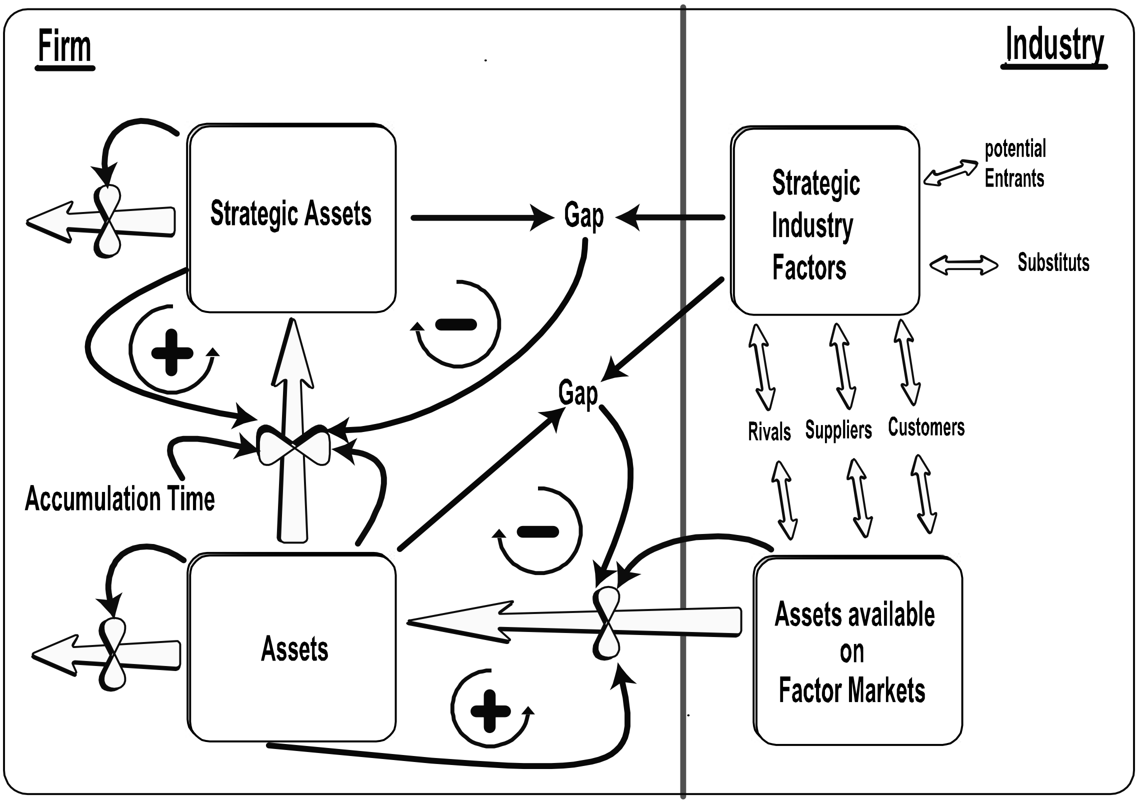

Figure 1: Firms as open resource accumulation systems

Resource accumulation process can be illustrated with the well known bathtub metaphor, with the amount of water in the bathtub representing the level of a resource (Dierickx and Cool 1989). This metaphor is particularly suitable for the illustration of such processes, as it has only one regulating mechanism, i.e. the water tab. Even though the dynamic implications behind an inflow are not apparent and therefore the mechanism itself is not easy to control, the erosion of assets is irrepressible and cannot be brought to a halt. Consequential, in order to remain successful, a company has to constantly reinvest in its assets.

In other respects, as it takes time to accumulate those assets, and as the requisites of a particular market are constantly shifting—even whole markets can arise and decline—, a firm has to estimate the appropriate amount of resources in order to stay or become successful. Closing such a "strategic gap" (Sanchez and Heene 1997) is no simple task, as a firm has not only to estimate the amount of strategic assets necessary, but to discover the mechanisms to apply. The latter might be more ambitious and therefore "firms that might be judged as high performers in creating [resources] may appear to be poor if evaluated by measures of current profitability" (Sanchez and Thomas 1996).

This aspect is illustrated in Figure 1 which pictures the resource accumulation processes of a firm. Firms can be accounted as open systems, as they acquire assets from factor markets, e.g. staff, materials, patents (Sanchez and Heene 2002), and do compete on markets for products and/or services. Such a view combines the resource-based and the market-based perspective, as it connects the factor and the product markets. The latter perspective is represented through market forces—substitutes, potential entrants, rivals, customers and suppliers (Porter 1980)—which determine the requisites ("strategic industry factors") to compete in a particular market. The latter three forces do occur as well on factor and product markets. E.g. rivals are competing for assets on same factor markets, or, depending on the strategic industry factors, a supplier might integrate "forward" resp. a customer "backward" alongside the value chain.

The strategic assets stand for the internal strengths of a firm and therefore illustrate the resource-based perspective in figure 1. The distinction between normal and strategic assets seams to be useful, as an industry has different demands on the resources possessed by a firm. Normal assets might be regarded as "qualifiers", which a firm needs to be able to participate in a particular industry, whereas the strategic assets do distinguish a firm in competition, and thus can be regarded as "order winners" (Hill 1993). As before-mentioned, it is more likely that order wining assets have to be accumulated from rather generic assets within the firm and cannot be acquired on factor markets.

There are two balancing feedback loops in figure 1, which try to close the gaps between internal strengths, other assets a firm applies, and external demands (Schoemaker and Amit 1994). Such goal seeking loops can be considered as routines resp.—as they increase levels—as rates (Mollona 2002). The circumstance that accumulation of strategic assets is a time consuming task and can not be shortened, is termed "time compression diseconomies" (Dierickx and Cool 1989, see also for the following) and is indicated with the variable "accumulation time" in figure 1. The arrows with the valves on the left side of figure 1 signify the above-mentioned irrepressible erosion on assets, which always persists. An other aspect that resources have to be developed by the use of other resources or by the use of the resource itself is indicated by the lower positive feedback loop in figure 1. Examples for this "interconnectedness" of resource accumulation are organizational learning that cannot occur without the resource staff, or resources which have to achieve a critical mass in order to continue to grow. The upper plus-sign in figure 1 refers to an effect called "asset mass efficiencies". E.g. a firm which already possesses a high stock of achievements in research and development finds it easier to attain more.

All this effects can create complex behaviour, whereby it is difficult for outsiders to understand the steps which have been made by a firm to accumulate its strategic assets. Such a condition is referred to be "causal ambiguous" and is necessary for a firm to sustain successful (Amit and Schoemaker 1993). As aforementioned, those mechanisms are likely to be ambiguous to members of the firm, too, but it is also likely that insiders have at least a larger tacit knowledge about the firm-internal processes (Reed and DeFillippi 1990). However, this discussion is beyond the aim of this paper because it is more an issue of literature on organizational learning and its constrains due to complexity (Argyris and Schön 1978; Milling, Größler, and Maier 2000).

Anyhow, since those mechanisms are ambiguous and therefore not easy to apply, the competence of a firm lies in the ability to coordinate the growth of several tangible and intangible resources.

In the next section, a System Dynamics model will be illustrated which gives insights to the resource accumulation process of a low-fare airline.

System Dynamic Analysis of Corporate Growth Processes

The model in this section bases on previous work of Morecroft (Morecroft 1997) and Warren (Warren 2002). The model elements are routines and resources; competences are not included. Latter are embodied in the different corporate growth strategies, which will be tested on that model. In the terminology of this paper, everything that "is regular predictable about business behaviour [can be] plausibly subsumed under the heading 'routine'" (Nelson and Winter 1982). Routines translate strategies into heuristics and rules, and therefore make strategies feasible. In this respect, a competence is in particular not a "killer capability that, if only be discovered and built, will ensure dominant performance" (Warren 2002). Thus a competence is the ability of an entrepreneur or a firm to anticipate ex ante the needs of markets and to formulate an accumulation strategy in order to achieve the assets necessary. These rules and heuristics are represented by specific parameter sets, which symbolize either the corporate growth strategy of SW or PE, or combinations of both approaches, in this case study. The parameter sets are necessary to provide crosschecks to the presumption made above that one has to take the pace and the path of corporate growth into account to analyse the different outcomes of SW and PE. The different parameter sets are illustrated in figure 2:

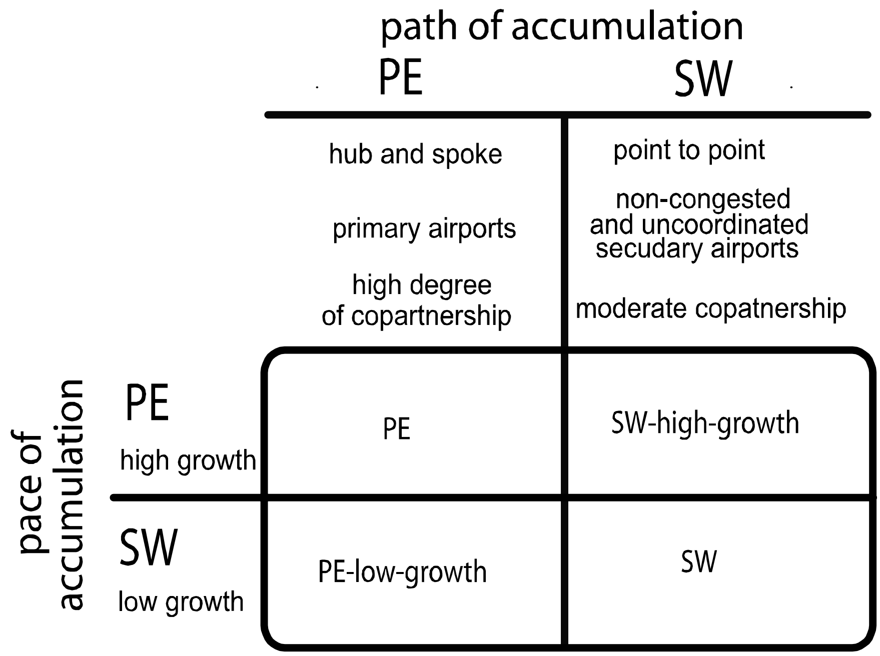

Figure 2: Simulation runs and parameter sets of the case study

The differences in the corporate growth approaches lead to a four-field matrix with the realistic parameter sets *PE* and *SW* and the two hypothetical sets *PE-low-growth* and *SW-high-growth* that serve as crosschecks. The pace of accumulation is exogenous to the model and is represented with the constant *ROUTES GRWOTH/MONTH* in figure 3. The other constants, which are all illustrated in table 2, represent the specific parameter sets of PE's and SW's pace and path of resource accumulation.

Constant	*People Express*	*Soutwest Airlines*	
ROUTES GROWTH/MONTH (Routes/Month)	0.65	0.15	**Pace**
POTENTIAL PASSENGERS PER CITY (People/Route)	400,000	200,000	**Path**
COSTS PER ASM (¢)	5.6	6.21	
AVERAGE ASL (Miles)	729	492	
FLIGHTS PER CITY SERVED (Flight/Route)	7,500	15,000	
TRIPS PER AIRCRAFT (Flight/Aircraft)	3,500	2,500	
DEGREE OF COPARTNERSHIP (Dmnl)	0.85	0.1	

Table 2: Specific parameter sets representing pace and path of resource accumulation

The number of *Cities in Service*[3] increases the number of *Potential Passengers* for the airline in the model. In this paper it is assumed that there are twice as many potential passengers on primary than on secondary airports. This and the other assumption of the case have been tested concerning their sensitivity. An assumption is regarded as valid, if variation of this supposition do not lead to different outcomes of the model (for an overview of validity tests, see Forrester and Senge 1980; Barlas 1996).

In the model the *Passengers* are attracted by the perceived *service fare ratio* of an airline in comparison to another. In contrast to *fare*, which may vary shortly during a day or a week, the *Reputation* of an airline does not differ in the short-term in the perception of its customers, if one neglects discrete events like plane crashes. Therefore, it is necessary for an airline that its potential and current customers have confidence in its services, in order to increase the number of passengers. Thus *Passengers* and *Reputation* are one example of the interconnectedness of resource accumulation in the model. Another example for that effect are *Financial Resources*, which are connected to growth of *Passengers* and *Aircrafts*:

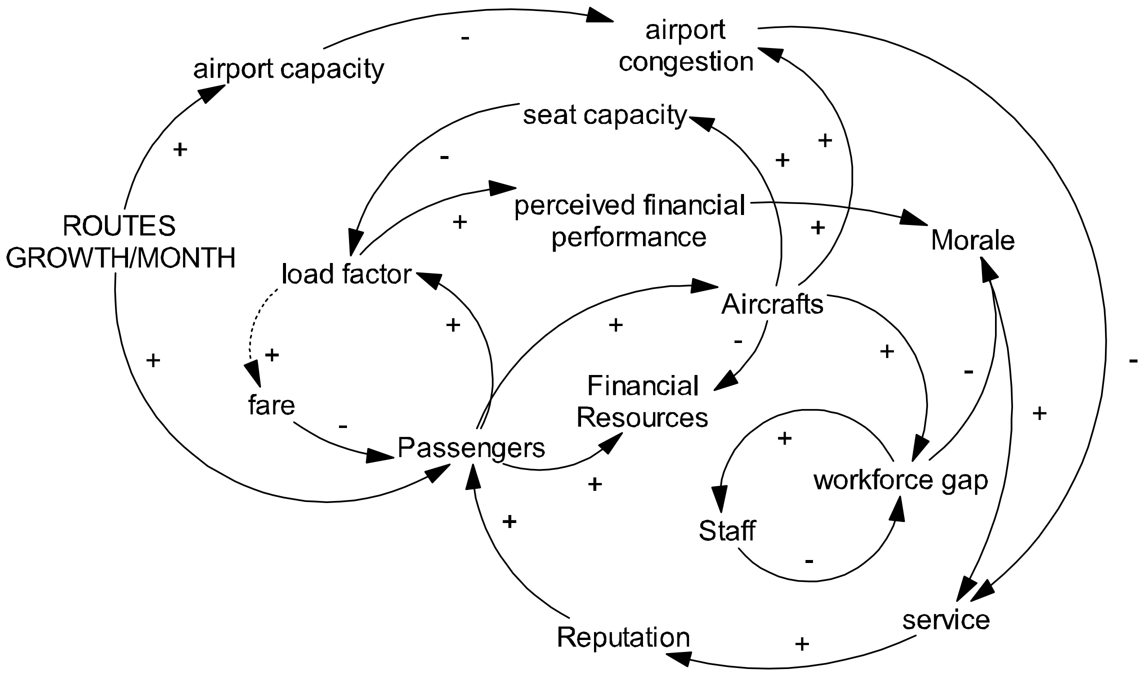

Figure 3: Main model structures[4]

Howsoever, even if *fare* can vary very rapidly during a day or during a week, it does not if one regards its average over a longer period of time. Both PE and SW offered flights to a more or less steady and low *fare*, and did not react strongly to variation of the *load factor* of their aircrafts. This weak causality is illustrated with a dotted arrow in figure 3.

In the model, the resource *Aircrafts* is adjusted accordingly to the trend of the passenger growth and these assets drive the demand of *Staff*. *New staff* is not as productive as experienced one, and therefore has to be trained by its experienced co-workers. As training consumes manpower and thus *ceteris paribus* lowers overall staff-productivity, the hiring of new staff leads only delayed to higher overall-productivity. This effect that costs are truly a product of the number of men and months, but work-progress is not, is known as "Brooks Law" (Brooks 1999), and can also be regarded as an example for time compression diseconomies, as given above. Reductions of recruiting and training times do not necessarily lead to a decrease to the adjustment time of an asset as the level may overshoot and oscillate stronger and therefore meets its appropriate level more slowly (for a detailed description, see Morecroft 2002). Anyhow, since experienced workforce is necessary to train recruits, this aspect can be regarded as asset mass efficiencies, as mentioned above.

The number of *Aircrafts* and *Staff* are two determining factors for change in *Morale*, in the model. It is assumed that both, long-lasting overstraining and unchallenging situations lower the morale of the staff. An airline might lessen this affect by offering higher financial incentives to its employees, with stock option programs and other forms of copartnership. PE, for instance, made excessive use of such programs to compensate its employees for high workload. As a result 85% of its stock was owned by its employees (Schlesinger and Whitestone 1983). But *copartnership* can be a two-edged sword, as the employees do participate to success and failure of the corporation on the stock markets. In contrast, only 10% of SW's stock is owned by its employees (Heskett and Hallowell 1997). Therefore, the *perceived financial performance* is an important factor to the *Moral* of the *Staff*. This aspect is represented with discrepancies between the perceived and the break-even *load factor* in the model as these indicators are apparent to the employees of an airline.

Both, *Morale* and *airport congestion* determine the change of *Reputation* in the model, as both factors are relevant for the service level perceived by the customers. The second aspect is related with the nature of a hub and spoke network since hub airports tend to be heavy congested, as feeder-traffic from the spoke-routes comes in and departs in waves to keep the waiting time acceptable for transit passenger. Additionally, such hub and spoke networks are costly to implement and to operate in comparison to loose-coupled point to point systems (Mayer and Sinai 2002; Dresner and Windle 1999). From the first aspects it follows that an airline which serves secondary, uncoordinated, and non-congested airports, can realise lower turning-times (the time span between landing and departure of an aircraft) and thus it achieves *ceteris paribus* higher productivity, in means of higher number of *TRIPS PER AIRCRAFT* (Doganis 1991).

The second point is only partial a consequence of the higher fees on primary airports in comparison to secondary airports. Since different types of routes, e.g. stage-length, passenger-volume, continental or intercontinental flights, make different demands on the aircrafts in service, e.g. fuel capacity, seating, cabin crew, pilots etc., variety in routes determines the heterogeneity of the fleet of an airline, and thus its operating expenses. PE did operate a lot of different types of aircrafts, e.g. B-747s (Jumbo Jets) on hub-hub routes and on overseas destinations, B-737s and B-727s (Airline History: *People Express* 2003), and hence was not able to achieve high economies of scale on maintenance, pilot training, aircraft leasing etc.. In contrast, SW does only operate one type of aircraft (B-737) on a very homogeneous point to point network (Inkpen and DeGroot 2002).

The historical time series of PE and SW (see appendix) do confirm this conclusions in some respects, as e.g. SW offered nearly two times the daily flights of PE, and therefore in the model its assumed, that the free capacity is twice as much on secondary as on primary airports. But in other respect, PE could achieve significant lower costs per ASM (¢5.62 vs. ¢6.21) than SW, albeit both low-fare carriers achieved a comparatively better cost position than their competitors. The better cost-efficiency of PE might be due to the higher economies of scale and length of haul (729 vs. 429 Miles *average stage length*), if one regards the haulage of passengers. Therefore, PE did suffer form the hub-and-spoke-specific cost-disadvantages, as described above, but could compensate them to some degree as PE did operate on the edge of its capacity. Howsoever, even with lower costs per available seat mile, PE did show a relatively unprofitable financial performance:

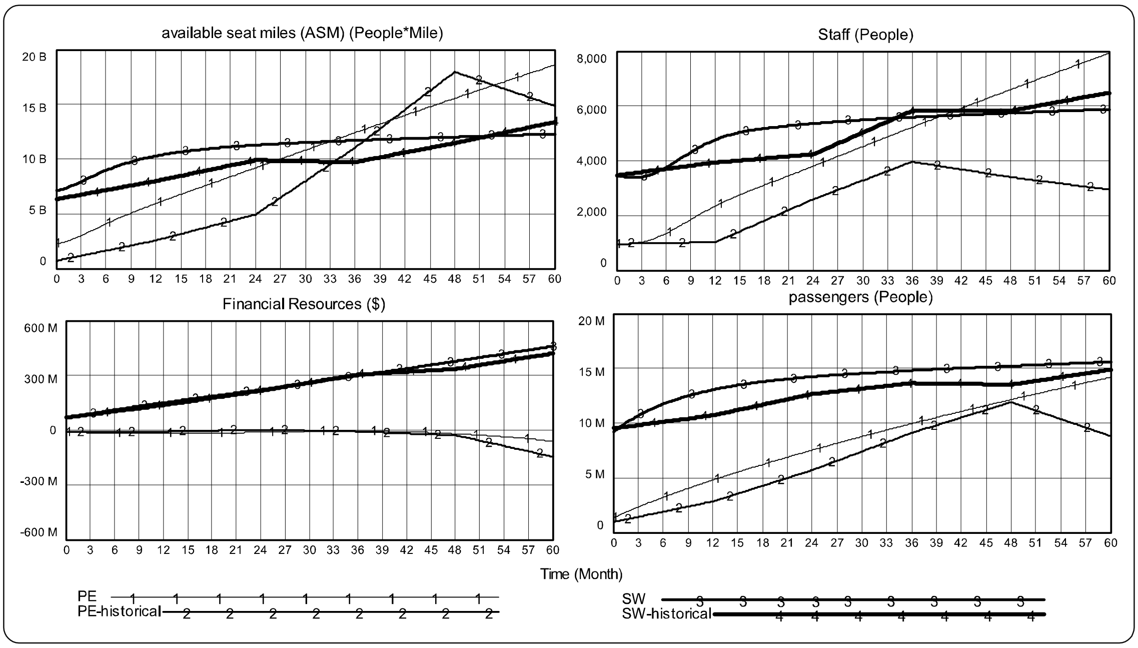

Figure 4: Comparison of simulated and historical time series

Figure 4 illustrates the simulation runs of the resource accumulation processes of PE and SW in comparison to historical time series. The discontinuance in the historical time series of PE, which occurs in the simulation month 48/49 (January 1985), is due to the introduction of American Airlines' "Ultimate Super Saver" program, which was the first implementation of yield management in the airline industry, and can be regarded as a "paradigm shift from horse and buggy to cars" (Donald C. Burr, former PE-CEO, in Beer 1990). Due to its yield management system, AA was able to offer tickets in a high variation of different fares, some even lower than those of PE. PE was not able to counter this new marketing attempt, since it suffered already from many quality and financial problems, in contrast to SW, which did well in that period (see time series in the appendix).

Correlation between historical time series and simulation runs in figure 5 vary from 0.83 to 0.99 (see coefficients of determination in the appendix C) for both carriers. To crosscheck these findings and to test the presumption given above, the model is simulated with PE's parameter set (i.e. path) and with SW's resource accumulation pace. The other hypothetical simulation run 'SW-high-growth' shows no general different behavior, and therefore is excluded, due to clarity of the graphs in this paper.

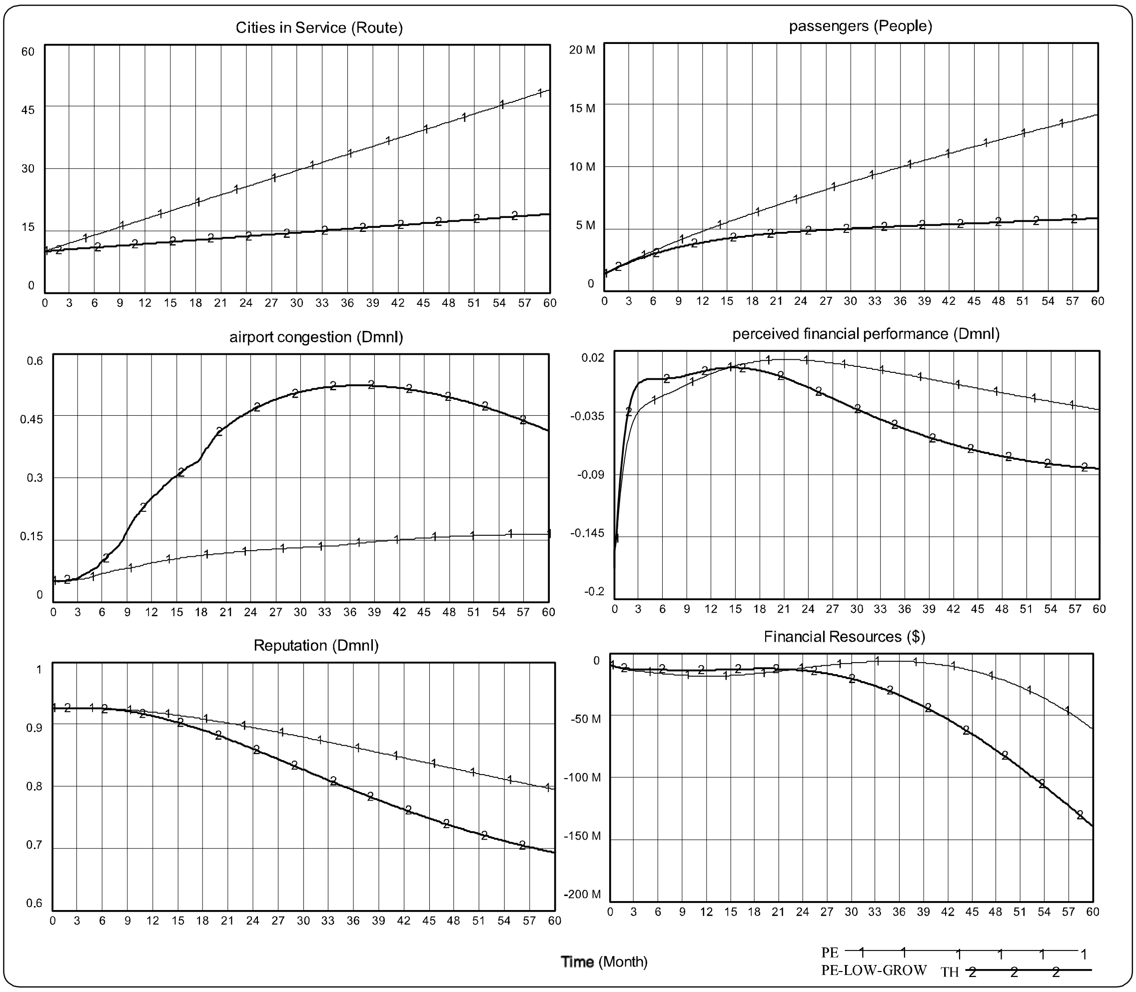

Figure 5: Simulation of People Express' corporate growth strategy with differing paces

The PE-low-growth run shows similar outcomes, or in other respect, it generates a clearer "worse before better" effect in comparison to the *PE run*, if one regards its *Financial Resources* in figure 5: As passenger attraction is mainly a result of PE's low fares and (at the beginning) is independent to the growth of destinations, PE does attract as many passengers as in the *PE run*. But since *ROUTES GROWTH/MONTH* is lower, growth rate of *Potential Passengers* is lower, too. This leads to some positive effects, e.g. lower *work pressure* as recruiting can keep up the pace more easily. Howsoever, as PE still abides to its low-fare marketing style and hence keeps the *fare* down, it still attracts a lot of *Passengers* out of the *Potential Passengers* on the airports already in service, comparatively to its corporate growth. Therefore PE grows more rapidly in its lower growing network, which leads to a higher growing *airport congestion*. Finally, the decline of PE's *Reputation* occurs faster and it's loosing *Financial Resources* more quickly.

The explanation to this puzzle is not that in the simulation run PE grows to fast and in the other it grows surprisingly to slow. The reason for the unprofitable behavior has more to do with the combination of high density airports and low-fare marketing style, since fare is the only mechanism to (hardly) control the *Potential Passengers*, but variation of fare is "prohibited" by the low-fare marketing style. Thus, the resources *Passengers* and *Aircrafts* do depend on the dynamics of the resources *Potential Passengers* and *Reputation*, which are both intangible, hard to determine, and uncontrollable. In contrast, SW's attempt achieves both, high frequency of schedule and low fares, which are the most important factors that influence the customer's decision for a specific airline (Liehr et al. 2001).

Need for Coherence of Corporate Growth Strategies

This paper finds that capabilities can be regarded as the ability of an entrepreneur or a firm to formulate a corporate strategy, to translate it down into routines and therefore to coordinate the growth of several resources, which may be tangible or intangible. As many resources have to be coordinated and several are of importance, there is no single factor distinguishable (e.g. a single "core competence"), which might ensure dominant competitive performance.

In the case of two low-fare and no-frills carriers, this paper shows that not only the pace of corporate growth is a critical factor for success, but the path of resource accumulation. The apparent explanation to PE's rise and decline is vast corporate growth. This paper finds, however, that growing on the lower pace of SW even worsens the financial outcome of PE. The simulation results therefore indicate that the path of SW, i.e. implementing a loose-coupled point to point network, applying only one aircraft type, serving secondary airports, moderate employee copartnership, etc, is the dominant corporate strategy for a low-fare and no-frills carrier. This findings lead to a more consistent picture of what happened in the U.S. airline industry after its deregulation, as it gives an explanation for the decline of PE and to the failure of several airline within an airline attempts. The commonality of the failed approaches was the combination of hub and spoke networks and the low-fare and no-frills marketing style.

Howsoever, as hub and spoke systems are the only cost-efficient way to connect a high variety of national and international destinations, and therefore have been implemented by all international majors, this strategy still is the dominate strategy for such airlines. It is necessary to a full-service major to give service to primary airports, in order to offer its passengers e.g. interlining and intercontinental connections. But the international full-service airlines find it more and more difficult to compete with local low-cost carriers, like "Southwest Airlines" and "Ryan Air", on short and medium length destinations. This raises the question if fares might rise resp. the possibilities of air-travel may decline as a result of this competition. Until now, however, the passengers do in particular benefit due to the competition of low-cost carriers like SW, as the Transport Research Board noted (Dresner and Windle 1999): "Probably the most significant development in the U.S. airline industry during the past decade has been the continued expansion of Southwest Airlines and the resurgences of low-fare generally."

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1 As more than 50% of all destinations are served by SW from "Chicago Midway", Baltimore/Washington, Las Vegas or Phoenix, these can be considered as "quasi-hubs" (Ito and Lee 2003). Anyhow, these airports are accounted to be secondary, uncoordinated and non-congested (Dresner and Windle 1999).

2 Edith Penrose's "Theory of the Growth of the Firm" (Penrose 1959) can be accounted as a reaction to the microeconomic-based "Industrial Organization" (Kimball and *Kimball* Jr. 1947; Bain 1968), which regards the environment of mainly homogeneous companies, which apply homogeneous resources to alike products.

3 The model variables are displayed italic in the following manner, for reading convenience: *CONSTANT, auxiliary, rate* and *Level.*

4 For the whole model, see the model listing in the appendix.

Appendix A – collected data of Southwest Airlines

	1983	1984	1985	1986	1987	1988	mean	variance
cities served	26	28	30	31	33	35		
-growth	*n/a*	7.0%	6.6%	6.2%	5.8%	5.5%	6.2%	0.0%
fleet size	46	54	70	79	75	85		
-growth	*n/a*	17.4%	29.6%	12.9%	-5.1%	13.3%	13.6%	1.2%
Trips flown	175,421	200,124	230,227	262,082	270,559	274,859	235,545	
-growth	*n/a*	14.1%	15.0%	13.8%	3.2%	1.6%	9.6%	0.4%
Trips per aircraft	3,814	3,706	3,289	3,317	3,607	3,234	3,495	60,176
Trips flown per city served	6,770	7,215	7,787	8,349	8,145	7,843	7,685	
aircrafts per city served	1.8	1.9	2.4	2.5	2.3	2.4	2.2	0.1
passenger revenue per RPM	$0.1113	$0.1112	$0.1100	$0.1059	$0.1002	$0.1074	$0.1077	$0.000015012
operating revenue per ASM	$0.0790	$0.0671	$0.0688	$0.0611	$0.0584	$0.0647	$0.0665	$0.000043318
operating expenses per ASM	$0.0600	$0.0586	$0.0608	$0.0700	$0.0653	$0.0579	$0.0621	$0.000018045
revenue passengers carried	9,511,000	10,697,544	12,651,239	13,637,515	13,503,242	14,876,582	12,479,520	
-growth	*n/a*	12.5%	18.3%	7.8%	-1.0%	10.2%	9.5%	0.5%
passengers carried per employee	2,743	2,719	2,987	2,342	2,319	2,293	2,567	69,653
-growth	*n/a*	-0.8%	9.9%	-21.6%	-1.0%	-1.1%	-2.9%	1.3%
average stage length (miles)	409	436	472	542	577	516	492	4145
aircraft utilization (h per day)	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*	*n/a*		
available seat miles	6,324,000,000	7,983,000,000	9,884,000,000	9,712,000,000	11,457,000,000	13,370,000,000	9,788,333,333	
-growth	*n/a*	26.2%	23.8%	-1.7%	18.0%	16.7%	16.6%	1.0%
revenue passengers miles (Mill.)	3,893,000,000	4,669,000,000	5,971,000,000	7,388,000,000	7,789,000,000	7,676,000,000	6,231,000,000	
-growth	*n/a*	19.9%	27.9%	23.7%	5.4%	-1.5%	15.1%	1.3%
passenger load factor	61.6%	58.5%	60.4%	58.8%	58.4%	57.7%	59.2%	0.0%
average anual break even load factor	53.9%	52.7%	55.3%	66.1%	65.1%	53.9%	57.8%	0.3%
operating revenues	$448,236,000.0	$535,948,000.0	$679,672,000.0	$768,790,000.0	$778,328,000.0	$860,000,000.0	$678,495,666.7	
-growth	*n/a*	19.6%	26.8%	13.1%	1.2%	10.5%	14.2%	0.9%
operating expenses	$379,738,000.0	$467,451,000.0	$601,148,000.0	$679,827,000.0	$747,887,000.0	$774,454,000.0	$608,417,500.0	
-growth	*n/a*	23.1%	28.6%	13.1%	10.0%	3.6%	15.7%	1.0%
operating profit	$68,498,000.0	$68,497,000.0	$78,524,000.0	$88,963,000.0	$30,441,000.0	$85,546,000.0	$70,078,166.7	
-growth	*n/a*	0.0%	14.6%	13.3%	-65.8%	181.0%	28.6%	83.5%
-accumulation	$68,498,000.0	$136,995,000.0	$215,519,000.0	$304,482,000.0	$334,923,000.0	$420,469,000.0		
total emplyees	3468	3934	4235	5822	5824	6488		
-growth	*n/a*	13.4%	7.7%	37.5%	0.0%	11.4%	14.0%	2.0%
-full time	3215	3805	4026	5337	5338	5812		
-growth	*n/a*	18.4%	5.8%	32.6%	0.0%	8.9%	13.1%	1.6%
-part time	253	129	209	485	486	676		
-growth	*n/a*	-49.0%	62.0%	132.1%	0.2%	39.1%	36.9%	46.0%
ratio part to full time employees	0.0787	0.0339	0.0519	0.0909	0.0910	0.1163	0.0771	0.0009
-emplyees per aircraft	75.4	72.9	60.5	73.7	77.7	76.3	72.7	39.0
-full-time emplyees per aircraft	69.9	70.5	57.5	67.6	71.2	68.4	67.5	25.7
-employees per city served	134	142	143	185	175	185	160.8	561.5
passenger carried per City served	367,035	385,648	427,910	434,436	406,511	424,518	407,676	709,480,222
average fare	$45.56	$48.53	$51.92	$57.37	$57.80	$55.42	$52.77	$24.83
consumer price index develop.	99.6	103.9	107.6	109.6	113.6	118.3		
average fare in 1983 prices	$45.56	$46.53	$48.06	$52.14	$50.67	$46.66	$48.27	$6.76

Data is based on the Harvard Business School case “Southwest Airlines: 1993 (A)” (Heskett and Hallowell 1997) and several annual reports. The highlighted row “cities served” is a assumption, based on the approximately constant growing “trips flown” and flight routes (Morrison and Winston 1995: S. 129, figure 6-1).

Appendix B – collected data of People Express:

	1981	1982	1983	1984	1985	1986	Mean	variance
cities served	10	16	20	33	49	49		
-growth	n/a	60.00%	25.00%	65.00%	48.48%	0.00%	39.70%	7.30%
fleet size	14	20	40	66	76	71		
-growth	n/a	42.86%	100.00%	65.00%	15.15%	-6.58%	43.29%	17.42%
trips per aircraft	1,295	2,588	2,122	2,194	2,850	2,353	2,421	89,513
trips flown	18,135	51,757	84,868	144,786	216,631	167,082	133,025	
trips flown per city served	1,813	3,235	4,243	4,387	4,421	3,410	3,939	
aircrafts per city served	1.4	1.3	2.0	2.0	1.6	1.4	1.6	0.11
total available seat miles (ASM)	692,618,000	2,554,379,000	4,917,387,000	11,029,809,000	17,949,178,000	14,855,193,000	8,666,427,333	
-growth	n/a	268.80%	92.51%	124.30%	62.73%	-17.24%	106.22%	110.20%
total passengers carried	952,000	2,835,000	5,698,000	9,098,000	11,907,000	8,807,000	6,549,500	
-growth	n/a	197.79%	100.99%	59.67%	30.87%	-26.04%	72.66%	70.29%
passenger carried per City served	95,200	177,188	284,900	275,697	243,000	179,735	232,104	2,641,213,409
passenger carried per aircraft in service	68,000	141,750	142,450	137,848	156,671	124,042	140,552	136,185,547
total revenue passengers miles (RPM)	403,993,000	1,554,626,000	3,668,366,000	7,700,944,000	10,961,871,000	8,700,295,000	5,498,349,167	
-growth	n/a	284.82%	135.96%	109.93%	42.34%	-20.63%	110.48%	132.19%
average anual load factor	58.3%	60.9%	74.6%	69.8%	61.1%	58.6%	63.9%	0.5%
average anual break even load factor	72.8%	60.7%	71.8%	71.1%	62.4%	68.8%	67.9%	0.3%
average anual costs per ASM	$0.067	$0.054	$0.056	$0.054	$0.053	$0.053	$0.056	$0.000029367
average anual yield per RPM	$0.092	$0.089	$0.078	$0.076	$0.085	$0.077	$0.083	$0.000046167
total operaiting revenues	$37,167,356	$138,361,714	$286,132,548	$585,271,744	$931,759,035	$669,922,715	$441,435,852	
-growth	n/a	272.27%	106.80%	104.55%	59.20%	-28.10%	102.94%	
total operating expenses	$46,405,406	$137,936,466	$275,373,672	$595,609,686	$951,306,434	$787,325,229	$465,659,482	
-growth	n/a	197.24%	99.64%	116.29%	59.72%	-17.24%	91.13%	
total operating profit	-$9,238,050	$425,248	$10,758,876	-$10,337,942	-$19,547,399	-$117,402,514	-$24,223,630	
-growth	n/a	104.60%	2430.02%	-196.09%	-89.08%	-500.60%	349.77%	
-accumulation	-$9,238,050	-$8,812,802	$1,946,074	-$8,391,868	-$27,939,267	-$145,341,781		
average stage length	424	548	644	846	921	988	729	50,044.71
total employees	960	1929	4237	5980	4518	5065		
-growth	n/a	100.94%	119.65%	41.14%	-24.45%	12.11%	49.88%	36.26%
full time emplyees	600	1020	2596	3962	3402	2944		
-growth	n/a	70.00%	154.51%	52.62%	-14.13%	-13.46%	49.91%	48.67%
part time emplyees	360	909	1641	2018	1116	2121		
-growth	n/a	152.50%	80.53%	22.97%	-44.70%	90.05%	60.27%	55.53%
ratio part to full time employees	0.6000	0.8912	0.6321	0.5093	0.3280	0.7204	0.6162	0.0453
-total employees per aircraft	69	96	106	91	59	71	82	331.575748286
-full-time employees per aircraft	43	51	65	60	45	41	51	94.143874663
-employees per city served	96	121	212	181	92	103	134	2,519.838619765
average fare in 1983 prices	$39.04	$45.97	$45.83	$56.28	$66.11	$63.09	$55.46	$88.75
consumer price index develop.	90.9	96.5	99.6	103.9	107.6	109.6		

Data is based on the Harvard Business School cases “People Express (A)” (Schlesinger and Whitestone 1983) and “People Express Airlines: Rise and Decline” (Beer 1990).

Appendix C – summary statistics for historical fit:

Run	**People Express**			
Variable	passengers	financial resources	staff	available seat miles
Coefficient of determination (R^2)	0.95766	0.94026	0.85113	0.96465
Variation	0.00495	0.85797	0.20474	0.22366
Covariation	0.2965	0.07842	0.12641	0.28471

Run	**Southwest Airlines**			
Variable	passengers	financial resources	staff	available seat miles
Coefficient of determination (R^2)	0.94763	0.99380	0.83201	0.89032
Variation	0.00072	0.22935	0.16982	0.11871
Covariation	0.095	0.29431	0.67248	0.21449

Calculations are based on the Vensim® module taken form Oliva 1996.

Appendix D – Model Listing

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"air & ground crew"=Staff*PRODUCTIVITY EXPERIENCED STAFF+New
Staff*(PRODUCTIVITY NEW STAFF-TRAINING EFFORT\)~People~|

"available seat miles (ASM)"="average stage length (ASL)"*seat
capacity~People*Mile~|

"average stage length (ASL)"="switch: PE <-> SW"*"PE: AVERAGE ASL"+(1-
"switch: PE <-> SW")*"SW: AVERAGE ASL"~Mile~|

"break-even load factor"=costs per ASM/yield per RPM~Dmnl~|

"no-shows"=smooth((1-current service)*seat capacity,PERCEPTION TIME
CUSTOMERS)*0.3~People~|

"PE INITIAL: $-9'238'050"=-9.23805e+006~$~|

"PE: 0.056 $ per ASM"=0.056~$/(People*Mile)~|

"PE: 2500 TRIPS PER AIRCRAFT"=2500~Flight/Aircraft~|

"PE: 7500 FLIGHTS PER CITY SERVED"=7500~Flight/Route~|

"PE: AVERAGE ASL"=729~Mile~|

"PE: COMPETITION FACTOR"=0.36~Dmnl~|

"PE: INITIAL AIRCRAFTS 14"=14~Aircraft~|

"PE: INITIAL ROUTES 10"= INITIAL(10)~Route~|

"PE: POTENTIAL PASSENGERS PER CITY 400000"=400000~People/Route~|

"revenue passenger miles (RPM)"=passengers*"average stage length
(ASL)"~People*Mile~|

"SW INITIAL: $68'498'000"=6.8498e+007~$~|

"SW: 0.0653 $ per ASM"=0.0653~$/(People*Mile)~|
```

```
"SW: 15000 FLIGHTS PER CITY SERVED"=15000~Flight/Route~|

"SW: 3500 TRIPS PER AIRCRAFT"=3500~Flight/Aircraft~|

"SW: AVERAGE ASL"=492~Mile~|

"SW: COMPETITION FACTOR"=0.48~Dmnl~|

"SW: INITIAL AIRCRAFTS 46"=46~Aircraft~|

"SW: INITIAL ROUTES 26"= INITIAL(26)~Route~|

"SW: PE: POTENTIAL PASSENGERS PER CITY 200000"=200000~People/Route~|

"switch: growth"=1~Dmnl~|

"switch: PE <-> SW"=1~Dmnl~|

"T: effect of flights on congestion"([(0,0)-
(1,1)],(0,0),(0.259939,0.0263158),(0.333333,0.0307018),(0.385321,0.048
2456),(\0.443425,0.0482456),(0.547401,0.0570175),(0.657492,0.0833333),
(0.752294,0.135965),(\0.83792,0.267544),(0.880734,0.342105),(0.892966,
0.407895),(0.911315,0.473684),(0.929664\,0.535088),(0.932722,0.557018)
,(0.938838,0.614035),(0.954128,0.710526),(1,1))~Dmnl~|

"T: effect of work pressure"([(0,0)-
(2,1)],(0,0),(0.1,0.00775048),(0.2,0.0214936),(0.3,0.0528657),(0.4,0.1
15325),\(0.5,0.22313),(0.6,0.382893),(0.7,0.582748),(0.8,0.786628),(0.
9,0.941765),(1,1),(1.1\,0.941765),(1.2,0.786628),(1.3,0.582748),(1.4,0
.382893),(1.5,0.22313),(1.6,0.115325\),(1.7,0.0528657),(1.8,0.0214936)
,(1.9,0.00775048),(2,0))~Dmnl~|

AIRCRAFT ADJUSTMENT TIME=5~Month~|

aircraft adjustment=((Booking Passengers/(DESIRED LOAD FACTOR*flights
per aircraft*SEATS PER FLIGHT)-Aircrafts\))/AIRCRAFT ADJUSTMENT
TIME+booking passengers trend*Aircrafts*(1-airport
congestion)~Aircraft/Month~|

Aircrafts= INTEG (aircraft adjustment,"switch: PE <-> SW"*"PE: INITIAL
AIRCRAFTS 14"+(1-"switch: PE <-> SW")*"SW: INITIAL AIRCRAFTS
46"\)~Aircraft~|

airport capacity=("switch: PE <-> SW"*"PE: 7500 FLIGHTS PER CITY
SERVED"+(1-"switch: PE <-> SW")*"SW: 15000 FLIGHTS PER CITY
SERVED"\)*Cities in Service~Flight~|

airport congestion="T: effect of flights on
congestion"(Aircrafts*flights per aircraft/airport capacity\)~Dmnl~|

ATTRITION TIME=2~Month~|

attrition=Staff*(0.05+(1-Morale)/20)/ATTRITION TIME~People/Month~|

booking passengers trend=trend(Booking Passengers,TREND TIME,trend
initial)~Dmnl/Month~|
```

```
Booking Passengers= INTEG (+passenger attraction,"switch: PE <->
SW"*INITIAL PASSENGERS PE+(1-"switch: PE <-> SW")*INITIAL PASSENGERS
SW\)~People~|

change in morale=(((1-degree of copartnership)*"T: effect of work
pressure"(work pressure)+degree of copartnership\*perceived financial
performance)-Morale)/MORALE CHANGE TIME~Dmnl/Month~|

change in reputation=(2/3*current service+1/3*(1-"no-shows"/seat
capacity)-Reputation)/REPUTATION CHANGE TIME~Dmnl/Month~|

Cities in Service= INTEG (destination growth,"switch: PE <-> SW"*"PE:
INITIAL ROUTES 10"+(1-"switch: PE <-> SW")*"SW: INITIAL ROUTES
26"\)~Route~|

confirmed passengers=Min(Booking Passengers,seat capacity)~People~|

costs per ASM="switch: PE <-> SW"*"PE: 0.056 $ per ASM"+(1-"switch: PE
<-> SW")*"SW: 0.0653 $ per ASM"~$/(People*Mile)~|

current service=(Morale+(1-airport congestion))/2~Dmnl~|

degree of copartnership="switch: PE <-> SW"*PE DEGREE OF
COPARTNERSHIP+(1-"switch: PE <-> SW")*SW DEGREE OF
COPARTNERSHIP~Dmnl~|

DESIRED LOAD FACTOR=0.65~Dmnl~|

DESTINATION GROWTH TIME=1~Month~|

destination growth=("switch: growth"*PE ROUTES GROWTH+(1-"switch:
growth")*SW ROUTES GROWTH)/DESTINATION GROWTH TIME~Route/Month~|

FARE ADKUSTMENT TIME=6~Month~|

fare=(smooth(T fare(load factor/DESIRED LOAD FACTOR),FARE ADKUSTMENT
TIME)-"switch: PE <-> SW"\*"PE: COMPETITION FACTOR"-(1-"switch: PE <->
SW")*"SW: COMPETITION FACTOR")*RIVALS FARE~$/People~|

Financial Resources= INTEG (+operating revenues-operating
expenses,"switch: PE <-> SW"*"PE INITIAL: $-9'238'050"+(1-"switch: PE
<-> SW")*"SW INITIAL: $68'498'000"\)~$~|

flights per aircraft="switch: PE <-> SW"*"PE: 2500 TRIPS PER
AIRCRAFT"+(1-"switch: PE <-> SW")*"SW: 3500 TRIPS PER
AIRCRAFT"~Flight/Aircraft~|

hiring=workforce gap/RECRUTING TIME~People/Month~|

INITIAL PASSENGERS PE=1.425e+006~People~|

INITIAL PASSENGERS SW=9.511e+006~People~|

INITIAL PE=960~People~|

INITIAL STAFF GROWTH PE=0.5~Dmnl~|

INITIAL STAFF GROWTH SW=0.14~Dmnl~|
```

INITIAL SW=3468~People~|

load factor="revenue passenger miles (RPM)"/"available seat miles (ASM)"~Dmnl~|
month=12~Month~|

MORALE CHANGE TIME=60~Month~|

Morale= INTEG (change in morale,0.9)~Dmnl~|

needed work force=Aircrafts*STAFF NEEDED PER AIRCRAFT~People~|

New Staff= INTEG (hiring-training,0.1*("switch: PE <-> SW"*Staff*INITIAL STAFF GROWTH PE+(1-"switch: PE <-> SW")*INITIAL STAFF GROWTH SW*Staff))~People~|

operating expenses="available seat miles (ASM)"*costs per ASM/month~$/Month~|

operating revenues=fare*passengers/month~$/Month~|

PASSENGER ADJUSTMENT TIME=4~Month~|

passenger attraction=(Potential Passengers*Max((1-rivals service fare ratio/service fare ratio),0))/PASSENGER ADJUSTMENT TIME\-(Booking Passengers*Max((rivals service fare ratio/service fare ratio-1),0))/PASSENGER ADJUSTMENT TIME~People/Month~|

passengers=Min(confirmed passengers-Max("no-shows",0),seat capacity)~People~|

PE DEGREE OF COPARTNERSHIP=0.85~Dmnl~|

PE ROUTES GROWTH=0.65~Route~|

perceived financial performance=load factor-"break-even load factor"~Dmnl~|

PERCEPTION TIME CUSTOMERS=6~Month~|

potential passengers growth=destination growth*("PE: POTENTIAL PASSENGERS PER CITY 400000"*"switch: PE <-> SW"+(\1-"switch: PE <-> SW")*"SW: PE: POTENTIAL PASSENGERS PER CITY 200000")~People/Month~|

Potential Passengers= INTEG (+potential passengers growth-passenger attraction,("PE: POTENTIAL PASSENGERS PER CITY 400000"*"switch: PE <-> SW"+(1-"switch: PE <-> SW"\)*"SW: PE: POTENTIAL PASSENGERS PER CITY 200000")*Cities in Service)~People~|

PRODUCTIVITY EXPERIENCED STAFF=1~Dmnl~|

PRODUCTIVITY NEW STAFF=0.5~Dmnl~|

RECRUTING TIME=2~Month~|

REPUTATION CHANGE TIME=30~Month~|

Reputation= INTEG (change in reputation,current service)~Dmnl~|

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RIVALS FARE=110~$/People~|

rivals service fare ratio=RIVALS SRVICE/RIVALS FARE~(People*Dmnl)/$~|

RIVALS SRVICE=1~Dmnl~|

seat capacity=Aircrafts*flights per aircraft*SEATS PER FLIGHT~People~|

SEATS PER FLIGHT=90~People/Flight~|

service fare ratio=Reputation/fare~(Dmnl*People)/$~|

STAFF NEEDED PER AIRCRAFT=80~People/Aircraft~|

Staff= INTEG (+training-attrition,"switch: PE <-> SW"*INITIAL PE+(1-
"switch: PE <-> SW")*INITIAL SW)~People~|

SW DEGREE OF COPARTNERSHIP=0.1~Dmnl~|

SW ROUTES GROWTH=0.15~Route~|

T fare([(0,0)-(2,2)],(0,0.95),(0.3,0.95),(1.7,1.05),(2,1.05))~Dmnl~|

TRAINING EFFORT=0.3~Dmnl~|

TRAINING TIME=3~Month~|

training=New Staff/TRAINING TIME~People/Month~|

trend initial=destination growth/Cities in Service~Dmnl/Month~|

TREND TIME=2~Month~|

work pressure=needed work force/"air & ground crew"~Dmnl~|

workforce gap=needed work force-"air & ground crew"~People~|

yield per RPM=fare*passengers/"revenue passenger miles
(RPM)"~$/(People*Mile)~|
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