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# Firm's characteristics and servitization performance: A bankruptcy perspective

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## Why this paper might be of interest to Alliance Partners:

This paper casts light on major debates and dilemmas in the fields of organisational strategy and management regarding moderator variables that affect the performance outcomes of service growth strategies in manufacturing companies. While considerable research has investigated the organisational structures and business processes that can best support emerging service initiatives, few studies have analysed the link between firm characteristics and service performance.

This paper takes a bankruptcy perspective, selecting five firm characteristics that the dominant literature would suggest affect bankruptcy likelihood - age, size, product diversification, service breadth, and management skills - and examines if these exhibit significant differences between non-bankrupt (i.e. successful) and bankrupt (i.e. unsuccessful) servitized firms. The study is based on quantitative evidence from 46 servitized firms that declared bankruptcy and 146 matched survivors.

Results indicate that successful firms tend to be older, larger and more diversified than unsuccessful ones. On the contrary, successful firms appear to offer less service types. Finally, there do not seem to be significant differences in service related management skills between successful and unsuccessful firms.

**May 2013**

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# Firm's characteristics and servitization performance: A bankruptcy perspective

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## Abstract

This study of 46 bankruptcies of servitized firms and 164 matched survivors examines the failure of servitization strategies. It investigates one relatively unexplored determinant of this phenomenon: the characteristics of the servitizing firm. Specifically, the study selects some major firm characteristics that are widely posited to relate to organisational failure, and examines whether they have a role in the failures of servitized firms. The data presented in the paper suggests that servitized firms are less likely to fail when they are larger, older, and more diversified. Interestingly, firms offering a higher range of services appear more likely to declare bankruptcy.

**Introduction**

The benefits for manufacturing companies of extending their offerings into services are well documented. We know a great deal about the circumstances, factors and trends that suggest that manufacturers should rethink their product offerings in order to be able to compete in terms of services delivered – that is, to servitize. On the contrary, it is still not clear how manufacturing companies can ensure the success of their service activities (Nordin et al., 2011; Ulaga and Reinartz, 2011). While managers and scholars generally agree that shifting to services can have positive performance outcomes, in reality studies and anecdotal evidence indicate mixed results (e.g. Neu and Brown, 2005; Fang et al., 2008; Eggert et al., 2011).

Academic research is increasingly interested in understanding what drives the success or failure of a manufacturer's effort to increase the service component of the business. However, this body of work is still at an early stage, and many questions require further investigation. The present paper advances in this direction, by examining one relatively neglected aspect affecting the performance outcomes of services: the characteristics of the servitizing firms. Specifically, the study selects some major firm characteristics that are widely posited to relate to organisational failure, and examines whether they play a role in the failure of servitized firms.

The study is based on previous research work by the authors, in which evidence from 75 servitized and 54 non-servitized manufacturers was used to explore how the process of servitization changes the risk structure of a firm (Benedettini et al., 2013). The findings indicated that servitized firms are exposed to more bankruptcy risks than their non-servitized peers. By comparing the characteristics of the bankrupt servitized firms with those of similar,

non-bankrupt firms, the study offers several observations about reducing the risk of service failure.

## Method

*Sample selection*

A bankruptcy sample was considered, which consisted of the 75 servitized manufacturing firms identified in the aforementioned study by the authors. Due to the methods used to gather this sample, it comprised exclusively companies with more than 100 employees and primary SIC code falling in the manufacturing (10–39) range. Selected firms also had to have filed for bankruptcy, regardless of whether they later emerged. In addition, they had to offer one or more of the 12 manufacturers' services defined by Neely (2008), as displayed in their annual reports.

A central part of the research design was to identify a pool of successful peers for each firm in this bankruptcy sample. Successful peers were firms that resembled the product/service portfolio of the targeted bankrupted firm and that had not filed for bankruptcy protection. This latter requirement was assumed to be a proxy for organisational success, although a more fine-grained assessment would have restricted the focus to top performers, such as firms with high levels of profitability compared to the industry average (Hambrick and D'Aveni, 1988).

The first step in the process was to compile a broad set of potential competitors. This set was determined mainly by using the Capital IQ database. Capital IQ provides more relevant competitor information than several other databases that were also considered (including Mergent Online, Hoovers and Factiva). In fact, while Capital IQ returns competitive information from sources such as SEC filings, press releases and direct company contacts, the other databases identify competitors by industry membership and location. Accurate competitor information is also offered by the Thomson One Banker and Bloomberg databases; however, these cover only a small number of the firms in the bankruptcy sample (12 and 14 respectively, essentially those that are still trading). In Capital IQ, 54 of the 75 target firms were found.

Competitor search using Capital IQ returned a list of approximately 1,000 suggested competitors. Beginning with this population, the sample was then restricted to those firms that could be compared with the bankrupted ones against the purpose of the study. Specifically, a firm had to match two conditions: (i) have some manufacturing activity in common with its bankrupted peer; and (ii) be servitized. Information about both manufacturing activities and servitization was drawn from the long business description in the Capital IQ database. As with the bankruptcy sample, a firm was deemed servitized if it offered one or more of the 12 types of service in Neely (2008). It must be noted here that, given the design employed, different breadths of product and service offerings are possible between matched firms. Some of the selected firms may have filed for bankruptcy. Thus, the sample was checked against the presence of bankruptcy-related events by enquiring for key company developments in Capital IQ. In a few cases, the company record in the database did not enable the check, and web searches were therefore run to this end. With the elimination of the bankruptcies, a sample of 198 comparable firms was obtained. The size of this sample was increased by the addition of 70 firms that had been identified during pilot tests using the other databases, leading to a final sample of 268 comparable firms. At least one comparable company was found for 50 of the bankruptcy cases, and at least five comparable companies were found in 26 cases.

*Data sources and measures*

Available literature guided the selection of five variables that may affect failure: age, size, product diversification, service breadth, and management skills. These were assessed according to the measures described below. All data was gathered from secondary sources: databases, financial documents, and company websites.

**Age.** Age was measured by the number of years that a bankrupted firm had been in existence when it filed for bankruptcy, or that a comparable company had been in existence when its bankrupted peer filed for bankruptcy. The date of the bankruptcy filings was available from the authors' previous study, as was the age of the bankrupted firms. In order to determine the age of the comparable companies, the Capital IQ and Mergent Online databases, company websites and 10-K forms were consulted. The year of foundation was found for 267 comparable companies. For 12 of these firms a negative age was calculated, indicating that they had been founded after the filing. These firms were eliminated from consideration.

**Size.** Firms' size was assessed as the number of employees in the year when the bankruptcy occurred. For comparable companies, the targeted year was clearly the year of the bankruptcy of the matched peer in the bankruptcy sample. The number of employees was gathered from the Compustat database and annual reports (10-K forms, 20-F forms or equivalents). In a few cases, the data for the bankruptcy year was unavailable, and the data for a proximate year (maximum two years before/after the bankruptcy) was taken. Ultimately, the measure was obtained for all 50 bankrupted firms and 200 comparable companies. Seven comparable companies were eliminated at this stage as they had less than 100 employees (only companies with more than 100 employees had been included in the bankruptcy sample). The elimination of small firms resulted in a biased estimator for firm size. However, this was consistent with other bankruptcy research (e.g. Sheppard, 1994; Henderson, 1999), which has used a similar method to control for the higher likelihood of failure of small and start-up companies (liability of smallness and liability of newness, respectively).

**Product diversification.** Product diversification was calculated as the number of manufacturing industries in which the firm participated. Industry was defined by the four-digit SIC code. Industry classification using the SIC system has been used in several previous bankruptcy studies (e.g. Hambrick and D'Aveni, 1988). The SIC data was drawn from the Capital IQ and Mergent Online directories; one SIC code was attributed to the firm if it was in the company record of any of the two databases. Consistent with the use of this measure for the product business, only manufacturing industries (i.e. SIC code groups 10–39) were considered. SIC codes were not available for 27 comparable firms. It must be acknowledged that there is a limitation in the data-collection method used at this stage. It was implicitly assumed that the SIC codes found in the databases were representative of the manufacturing activities at the time of the bankruptcy. This is not necessarily true, since the databases provide current SIC codes while the manufacturing activities of a firm may have changed from the time of the bankruptcy. However, unfortunately, there was no practical way to obtain SIC codes at the time of the bankruptcy (to the authors' knowledge, there is no source that provides information about SIC code changes).

**Service breadth.** To analyse the breadth of the firms' service offering, a classification scheme was necessary that identified the various services that a manufacturing firm might offer. The 12 service types suggested by Neely (2008) were again applied. Thus, service breadth was defined

as the number of such service types that the firm offered at the time of the bankruptcy (meaning the bankruptcy of the firm itself or of its bankrupt match). The determination involved accessing the annual reports of the companies (10-K forms, 20-F forms or equivalents) and searching for evidence of each of the 12 service types. A 0–1 variable was used to perform this coding: a company was coded 1 it offered the service; 0 otherwise. When the annual report of the bankruptcy year was not available, the annual report of a proximate year was also deemed to be suitable. Several sources were accessed for this task, including the Capital IQ, Mergent Online and SEC databases, which returned a suitable annual report for 200 companies. No definitive evidence of servitization was found in the annual reports of 31 of these companies, often due to the fact that the firms had only recently servitized (database business descriptions, including those used to identify these companies, reflect the current activities of the firms). With this elimination, the remaining sample of comparable firms can be considered as those that could be compared with their bankrupt match at the time of the bankruptcy. The sample included at least one comparable company for 49 bankrupt firms. As previously noted, these firms did not necessarily offer the same products and services as their match. The sample was therefore carefully reviewed and the firms that were deemed to offer very similar products and services to their bankrupt match were labelled as close competitors. In all, 51 close competitors were identified. These involved 29 bankrupt firms.

**Management skills.** This variable was constructed in order to reflect managers' experience in services, since a central question was whether failed firms had been unable to manage the service infusion. Specifically, the level of management skills was calculated as the number of directors having service experience over the total number of directors. Director profiles can be found in annual reports or, for firms filing with SEC, in DEF 14A forms (such forms are compiled to provide security holders with sufficient information to elect directors at the annual shareholder meeting). Clearly, the documents accessed referred to the year of the target bankruptcy or the closest year available. A director was coded to have service experience if he/she had been employed at a service company before joining the company in question. Only service companies offering services that were also offered by manufacturers (again any of the 12 service types suggested by Neely (2008)) were considered relevant. In addition, accounting and legal roles were deemed not to qualify directors for service experience. A similar assessment was conducted regarding executive officers throughout data that, in this latter case, was mainly extracted from annual reports. Each company typically had about ten directors and an equal number of executive officers, making the coding a task of significant proportions. In consideration of this, as well as the explorative nature of the study, the measure was restricted to the close competitors. Input data regarding directors was found for 28 of the relevant bankrupt firms and 46 of their close competitors. As for executive officers, it was possible to determine service skills for 33 close competitors and 26 bankrupt firms. No management-skill information was found for the close competitors of one of the bankrupt firms.

The list of companies in each of the final samples of bankrupt and comparable companies is included in the Appendix. The list contains 46 bankrupt and 164 comparable companies, for which all the measures of age, size, product breadth, and service breadth were determined. These included 48 close competitors, also indicated in the table.

## Results

The first step in analysing the data was to look at the selected variables across the two samples of bankrupt and non-bankrupt firms. A logistic regression was run with firm age, size, product diversification and number of services as input variables and bankruptcy (0 for non-bankrupt firms; 1 for bankrupt firms) as the outcome variable. The results are summarised in Table 1, along with the model specifications. The analysis suggests a significant relationship between bankruptcy, firm size and product diversification, supporting the idea that larger and more diversified firms are less likely to fail. On the contrary, the results in Table 1 indicate no significant relationship regarding age or number of services offered.

*Table 1 – Logistic regression DV=0/1 (bankrupt or not) N=199*

**Model Summary**

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|---|---|---|---|
| 1 | 190.116[a] | .171 | .260 |

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than .001.

**Classification Table[a]**

| Observed | | | Predicted | | |
|---|---|---|---|---|---|
| | | | Bankrupt | | Percentage Correct |
| | | | 0 | 1 | |
| Step 1 | Bankrupt | 0 | 164 | 1 | 99.4 |
| | | 1 | 35 | 14 | 28.6 |
| | Overall Percentage | | | | 83.2 |

a. The cut value is .500.

**Variables in the Equation**

| | | B | S.E. | Wald | df | Sig. | Exp(B) |
|---|---|---|---|---|---|---|---|
| Step 1[a] | Age | -.003 | .006 | .211 | 1 | .646 | .997 |
| | @#man.SICcodes | -.558 | .163 | 11.644 | 1 | .001 | .572 |
| | LnSize_employees | -.270 | .115 | 5.511 | 1 | .019 | .763 |
| | @#services | -.040 | .120 | .108 | 1 | .742 | .961 |
| | Constant | 2.400 | .816 | 8.657 | 1 | .003 | 11.027 |

a. Variable(s) entered on step 1: Age, @#man.SICcodes, LnSize_employees, @#services.

As the Appendix illustrates, the sampling procedure provided varying numbers of comparable companies, depending on the bankrupt firm. Thus, it is possible that the non-bankruptcy sample contains a larger proportion of firms in some industries than the bankruptcy sample. Firms in one industry may tend to be older, larger, more diversified, etc. than the firms in other industries. In this scenario, the results of the logistic regression would not reflect differences between bankrupt and non-bankrupt firms, but rather the composition of the sample. In order to control for this possibility, a set of paired t-tests were conducted, which compared the bankrupt firms with their comparable, non-bankrupt peers. Given that the tests related to the independent effects of the study variables, they were not restricted to the selected list of companies in the Appendix. All the companies that had not been eliminated from the sample, and for which data was available, were included in the assessment of each variable. Table 2 (Panel A) gives descriptive statistics for the key variables in the two samples of bankrupt and non-bankrupt comparable firms. The t-test results (Panel A of Table 3) indicate that the bankrupted firms are younger and smaller than their non-bankrupted matches (Sig. 2-tailed values 0.002 and 0.000). Furthermore, the results strongly indicate that the bankrupted firms have less diversified manufacturing activities and offer a larger number of service types, as

shown by Sig. 2-tailed value = 0.000. The statistical tests also involved the management skills' variable; no significant differences were found regarding the level of service experience of either directors or executive officers.

Finally, Panel B of both Table 2 and Table 3 tighten the analysis by repeating the t-tests for the bankrupt firms and their close competitors only. These tests confirm the previous findings, although difference in age is only marginally significant between the two groups of firms (Sig. 2-tailed values 0.060 and 0.176 respectively).

*Table 2 – Paired sample statistics*

**Panel A: Paired Sample Statistics of Bankrupt and Comparable Firms**

| | | Mean | N | Std Deviation | Std Error Mean |
|---|---|---|---|---|---|
| Pair 1 | Age | 34.27 | 49 | 37.102 | 5.300 |
| | Agecompavg | 56.87422261 | 49 | 36.403349861 | 5.200478552 |
| Pair 2 | Size(employees) | 4344.67 | 48 | 6641.504 | 958.619 |
| | Sizecompavg | 3.5931629E4 | 48 | 5.58895051E4 | 8.06695521E3 |
| Pair 3 | # man.SICcodes | 1.71 | 49 | 1.258 | .180 |
| | #manSICcompavg | 3.050226747 | 49 | 1.3839414615 | .1977059231 |
| Pair 4 | # services | 6.006101219 | 48 | 3.3482682211 | .4832808897 |
| | #servcomp | 2.521378965 | 48 | 1.7620856535 | .2543351566 |
| Pair 5 | percent_exec_servexp | 13.3425 | 22 | 18.67352 | 3.98121 |
| | percent_exec_servexp_comp | 13.5673 | 22 | 13.49658 | 2.87748 |
| Pair 6 | percent_dir_servexp | 40.3295 | 27 | 16.88868 | 3.25023 |
| | percent_dir_servexp_comp | 42.9111 | 27 | 20.32996 | 3.91250 |

**Panel B: Paired Sample Statistics of Bankrupt and Close Firms**

| | | Mean | N | Std Deviation | Std Error Mean |
|---|---|---|---|---|---|
| Pair 1 | Age | 38.93 | 28 | 39.955 | 7.551 |
| | Ageclosavg | 60.26488107 | 28 | 42.327093553 | 7.999068804 |
| Pair 2 | Size(employees) | 5504.36 | 28 | 7652.977 | 1446.277 |
| | Sizecloseave | 1.156946E4 | 28 | 2.0866446E4 | 3.9433876E3 |
| Pair 3 | # man.SICcodes | 1.36 | 28 | .559 | .106 |
| | #manSICcloseavg | 3.026785714 | 28 | 2.0711437951 | .3914093865 |
| Pair 4 | # services | 6.404804464 | 28 | 3.7698605948 | .7124366865 |
| | #servclose | 1.940476189 | 28 | 1.4658066258 | .2770114144 |
| Pair 5 | percent_exec_servexp | 15.9428 | 24 | 22.47872 | 4.58845 |
| | percent_exec_servexp_close | 12.2174 | 24 | 13.52844 | 2.76148 |
| Pair 6 | percent_dir_servexp | 40.3295 | 27 | 16.88868 | 3.25023 |
| | percent_dir_servexp_close | 42.9111 | 27 | 20.32996 | 3.91250 |

*Table 3 – Paired t-test results*

**Panel A: Paired Samples Test of bankrupt and comparable firm averages N=~49**

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confid. Interval of the Difference Lower | Upper | | | |
| Pair 1 | Age - Agecompavg | -22.608916490 | 47.426505124 | 6.775215018 | -36.231399295 | -8.986433685 | -3.337 | 48 | .002 |
| Pair 2 | Size(employees) - Sizecompavg | -3.15869619E4 | 5.63293743E4 | 8.13044485E3 | -4.79433072E4 | -1.52306166E4 | -3.885 | 47 | .000 |
| Pair 3 | # man.SICcodes - #manSICcompavg | -1.3359410327 | 1.8312487178 | .2616069597 | -1.8619370786 | -.8099449867 | -5.107 | 48 | .000 |
| Pair 4 | # services - #servcomp | 3.4847222542 | 2.2722185005 | .3279664907 | 2.8249387776 | 4.1445057307 | 10.625 | 47 | .000 |
| Pair 5 | percent_exec_servexp - percent_exec_servexp_comp | -.22476 | 26.48557 | 5.64674 | -11.96781 | 11.51828 | -.040 | 21 | .969 |
| Pair 6 | percent_dir_servexp - percent_dir_servexp_comp | -2.58162 | 26.16339 | 5.03515 | -12.93151 | 7.76828 | -.513 | 26 | .612 |

**Panel B: Paired Samples Test of bankrupt and close firm averages N=~28**

| | | Paired Differences | | | | | t | df | Sig. (2-tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | Mean | Std. Deviation | Std. Error Mean | 95% Confid. Interval of the Difference Lower | Upper | | | |
| Pair 1 | Age - Ageclosavg | -21.336309643 | 57.467124707 | 10.860265753 | -43.619734331 | .947115045 | -1.965 | 27 | .060 |
| Pair 2 | Size(employees) - Sizecloseave | -6.0651012E3 | 2.3095979E4 | 4.3647299E3 | -1.5020787E4 | 2.8905847E3 | -1.390 | 27 | .176 |
| Pair 3 | # man.SICcodes - #manSICcloseavg | -1.6696428571 | 2.1655365245 | .4092479356 | -2.5093502603 | -.8299354540 | -4.080 | 27 | .000 |
| Pair 4 | # services - #servclose | 4.4643282750 | 2.4955452296 | .4716137188 | 3.4966568548 | 5.4319996952 | 9.466 | 27 | .000 |
| Pair 5 | percent_exec_servexp - percent_exec_servexp_close | 3.72539 | 30.07148 | 6.13832 | -8.97269 | 16.42346 | .607 | 23 | .550 |
| Pair 6 | percent_dir_servexp - percent_dir_servexp_close | -2.58162 | 26.16339 | 5.03515 | -12.93151 | 7.76828 | -.513 | 26 | .612 |

## Discussion and conclusions

The present study examines the proposition that firm characteristics are an important moderator of the performance outcomes of service growth strategies in manufacturing. More specifically, it examines from a servitization perspective some firm characteristics traditionally related to bankruptcy. By investigating whether these characteristics differ between failing and successful servitized firms, the study offers several observations about avoiding failure in servitized manufacturing companies.

The findings indicate that larger firms have an advantage over smaller ones, reflecting a typical argument of the organisational ecology view of failure (e.g. Hannan and Freeman, 1984; Sutton, 1997). The findings also suggest that older firms may be favoured over younger ones, although the level of significance obtained in the statistical tests indicates that this conclusion must be regarded as tentative. It must be noted that the bankruptcy prediction literature has different views about age dependence. While some authors claim that older firms are favoured over younger ones (liability of newness argument), some others have observed that bankruptcy rates increase or have an inverted U-shaped relationship with age (liability of obsolescence and adolescence, respectively). Thus, the findings suggest that it would probably be appropriate when furthering this study to consider age dependence not as a universal tendency but as a pattern that is contingent to industry-specific or firm-specific contingencies (Henderson, 1999).

Of particular interest are the findings pertaining to the impact of product and service diversification. Non-bankrupt firms consistently display a higher diversification of product activities. This is in agreement with portfolio theory, which argues that when a firm introduces new business activities it spreads its risks. In contrast, the paired t-tests indicate that non-bankrupt firms offer a smaller number of service types. The latter result indicates that adding more services is not always beneficial to firms; hence, ultimately diversification may lead to different consequences across manufacturing and service activities. However, it is possible that service diversification is a symptom rather than a cause of failure; troubled firms may add

services in the attempt to create new revenue opportunities. This is also an aspect that future work will need to explore.

Finally, the data does not reflect significant differences in the service skills of managers between bankrupt and non-bankrupt firms. This may appear surprising, since management characteristics are considered one of the most important factors affecting bankruptcy (Hambrick and Mason, 1984; Mellahi, 2005; Szilagyi and Schweiger, 1984). In addition, the servitization literature strongly emphasises the need for the organisation and its employees to adopt a service-oriented mindset (Gebauer and Friedli, 2005; Neu and Brown, 2005; Gebauer and Kowalkowski, 2012). A possible explanation is that service experience is not equal to servitization experience; servitization poses its own unique challenges.

The set of variables examined in the paper is not intended to be an exhaustive list regarding firm characteristics possibly related to servitization failure. However, it has given us an interesting range with which to begin our exploration of the topic.

**Acknowledgements**

We would like to thank Peter Dang for his help with the collection of the data used in the study.

**References**

- Benedettini, O., Neely, A. and Swink M., "Why do servitized firms fail? A risk-based explanation", paper under review.
- Eggert, A. Hogreve, J. and Ulaga, W. (2011), "Industrial services, product innovations, and firm profitability: A multiple-group latent growth curve analysis", *Industrial Marketing Management*, Vol. 40, No. 5, pp. 661–670.
- Fang, E., Palmatier, R.W., Steenkapt, J.E.M. (2008), "Effects of service transition strategies on firm value", *Journal of Marketing*, Vol. 72, No. 5, pp. 1–14.
- Gebauer, H. and Friedli, T. (2005), "Behavioural implications of the transition process from products to services", *Journal of Business & Industrial Marketing*, Vol. 20, No. 2, pp. 70–78.
- Gebauer, H. and Kowalkowski, C. (2012), "Customer-focused and service-focused orientation in organizational structures", *Journal of Business and Industrial Marketing*, Vol. 27, No. 7, pp. 527–537.
- Hambrick, D.C. and D'Aveni, R.A. (1988), "Large corporate failures as downward spirals", *Administrative Science Quarterly*, Vol. 33, No. 1, pp. 1–23.
- Hambrick, D.C. and Mason, P.A. (1984), "Upper echelons: The organization as a reflection of its top managers", *Academy of Management Review*, Vol. 9, No. 2, pp. 193–206.
- Hannan, M.T. and Freeman, J. (1989), *Organizational Ecology*. Cambridge, MA: Harvard University Press.
- Henderson, A.D. (1999), "Firm strategy and age dependence: A contingent view of the liabilities of newness, adolescence, and obsolescence", *Administrative Science Quarterly*, Vol. 44, No. 2, pp. 281–314.
- Mellahi, K. (2005), "The dynamics of boards of directors in failing organizations", *Long Range Planning*, Vol. 38, No. 3, pp. 261–279.
- Neely, A. (2008), "Exploring the financial consequences of the servitization of manufacturing", *Operations Management Research*, Vol. 1, No. 2, pp. 103–118.
- Neu, W.A. and Brown, S.W. (2008), "Manufacturers forming successful complex business services: Designing an organization to fit the market", *International Journal of Service Industry Management*, Vol. 19, No. 2, pp. 232–251.

- Nordin, F., Kindström, D., Kowalkowski, C. and Rehme, J. (2011), "The risks of providing services", *Journal of Service Management*, Vol. 22, No. 3, pp. 390–408.
- Sheppard, J.P. (1994), "Strategy and bankruptcy", *Journal of Management*, Vol. 20, No. 4, pp. 795–833.
- Sutton, J. (1997), "Gilbrat's legacy", *Journal of Economic Literature*, Vol. 35, No. 1, pp. 461–501.
- Szilagyi, A.D. and Schweiger, D.M. (1984), "Matching managers to strategies: A review and suggested framework", *Academy of Management Review*, Vol. 9, No. 4, pp. 626–637.
- Ulaga, W. and Reinartz, W.J. (2011), "Hybrid offerings: Manufacturing firms combine goods and services successfully", *Journal of Marketing*, Vol. 75, No. 6, pp. 5–23.

*Appendix – Companies in the final samples of bankrupt and non-bankrupt firms (* indicates close competitors)*

| Bankrupt | Comparable non-bankrupt | Bankrupt | Comparable non-bankrupt | Bankrupt | Comparable non-bankrupt |
|---|---|---|---|---|---|
| Torch Offshore Inc. | Horizon Offshore Inc. | Owens Corning | Comp. de S.-Gobain | STM Wireless | Motorola Solutions |
| | Global Industries | | CRH plc | | ViaSat Inc.* |
| | Subsea 7 Inc.* | | James Hardie Ind. Plc | Verilink Corp. | Carrier Access Corp. |
| | Technip | | PPG Industries Inc. | | Netopia Inc. |
| Oglebay Norton | Martin Mar. M. Inc.* | | Rockwool Int. A/S | | Paradyne Netw. Inc. |
| Encomp. Serv. Corp. | EMCOR Group Inc. | | The Dow Chem. C. | | Quick E. Netw. Inc. |
| | MYR Group Inc.* | Bayou Steel | Comm. Metals Comp. | | Zhone Techn. Inc. |
| | Johnson Controls Inc. | | Nucor Corporation | | Aruba Networks Inc. |
| | Schneider Electr. S.A. | | Steel Dynamics Inc. | | Extreme Netw. Inc. |
| | The Trane Company | | ArcelorMittal | | Juniper Netw. Inc. |
| | United Techn. Corp. | | Chap. Steel C. Inc. | Astropower Inc. | SunPower Corp. |
| Integr. Electr. Serv. | EMCOR Group Inc. | | Gerdau Amer. Corp. | Loral S.&Comm. Inc. | Lockheed Mart. Corp. |
| | MYR Group Inc.* | Bethlehem Steel | Nucor Corp.* | | The Boeing Company |
| | Dycom Industr. Inc.* | | Commercial Met. Co. | | EADS N.V. |
| | Matrix Serv. Comp. | | Ispat Inland Inc.* | Three Five Syst. Inc. | Benchm. Electr. Inc.* |
| | MasTec Inc.* | | Steel Dynamics Inc.* | | Int. DysplayW. Inc. |
| | MDU Res. Group Inc. | | US Steel Corp. | | Key Tronic Corp. |
| Worldtex Inc. | Hallwood Group Inc. | Birmingham Steel | Commercial Met. Co. | | LaBarge Inc. |
| Tultex Corp. | PVH Corp.* | | Friedman Ind. Inc.* | | Pemstar Inc. |
| | Oxford Industr. Inc.* | | Arc.Mittal USA LLC | | Planar Systems Inc. |
| | Hampshire Gr. Ltd. | | Steel Dynamics Inc.* | | Plexus Corp. |
| | Passport Brands Inc.* | | Chap. Steel C. Inc.* | | Samsung El. Co. Ltd. |
| Trop. Sp. Int. Corp. | VF Corp. | | Gr. Sim. SAB de CV* | | SigmaTron Int. Inc. |
| | Ralph Lauren Corp. | LTV Corp. | Nucor Corp.* | | Suntron Corp. |
| | PVH Corp.* | Global Power Eq. Gr. | Alstom | ViaSystems Group | Multi-Finel. El. Inc.* |
| | Ellis (Perry) Int. Inc.* | | Foster Wheeler | | DDi Corp. |
| | Oxford Industries* | Amcast Industr. Corp. | Mueller Ind. Inc.* | | Celestica Inc. |
| Burlington Ind. Inc. | Culp Inc.* | | Alcoa Inc. | | DDi Toronto Corp. |
| Pillowtex Corp. | Culp Inc.* | | Superior Ind. Int. Inc. | | Flextronics Int. Ltd. |
| | Hallwood Group | Texas Equipm. Corp. | AGCO Corporation* | | Jabil Circuit Inc.* |
| Crown Pacific | Weyerhaeuser Co. | | CNH Global NV | | Merix Corporation |
| Partners | Universal Forest Prod. | HiRise Rec. Syst. Inc. | McClain Ind. Inc. | | Benchmark El. Inc.* |
| | Deltic Timber Corp. | Silicon Graphics Inc. | Dell | ACT Manufacturing | Benchmark El. Inc. |
| | Weyerhaeuser Co. | | Hewlett-Packard | | Celestica Inc. |
| Treesource Ind. Inc. | Deltic Timber Corp. | | Int. Bus. Mach. Corp. | | Flextronics Int. Ltd. |
| | Cavco Industries Inc. | Platinum Entert. Inc. | Maltby Capit. Limit.* | | Jabil Circuit Inc.* |
| Oakw. Homes Corp. | Skyline Corp. | | Sony Music Ent. Inc. | | Plexus Corp. |
| | KIT Manufact. Co. | | Warn Music Gr. Corp. | | Sanmina Corporation |
| | Nobility Homes Inc. | AM Commun. Inc. | Cisco Systems Inc. | Dura Aut. Syst. Inc. | Johnson Controls Inc. |
| | | | Tollgr. Comm. Inc.* | | Williams Contr. Inc.* |
| Crown Vantage | Int. Paper Co.* | COM 21 | Cena Corp. | | Meritor Inc. |
| Hauser Inc. | USANA H. Sc. Inc. | | Samsung El. Co. Ltd. | Feris International | Harley-Davidson Inc. |
| | Nature's S. Prod. Inc. | | ADC Telec. Inc.* | | BMW |
| | Medifast Inc | | Arris Group Inc.* | | Ducati Mot. H. SpA* |
| | Mannatech Inc. | | Cisco Systems Inc. | | Honda Motor Co. Ltd. |
| | Nutraceut. Int. Corp. | | Motorola Solut. Inc. | Acterna Corp. | Spirent Comm. Plc. |
| | Nat. Alternat. Int. Inc. | | Scientific-Atl. LLC | | Tektronix Inc. |
| Solutia Inc. | Bridgestone Corp. | | Terayon C. S. Inc.* | | Teradyne Inc. |
| | Honeywell | Elcotel Inc. | Alcatel Luc. USA Inc. | | Tollgrade Comm. Inc. |
| | International Inc. | Metaw. Comm. Corp. | Alcatel Lucent SA | Fischer Imaging Corp. | GE Company |
| | PolyOne Corporation | | Ericcson | | Siemens Aktiegeng. |
| | Mom. Spec. C. Inc. | | Motorola Solutions | Henley Healthc. Inc. | Empi Inc.* |
| FGI Group Inc. | Brown Shoe Co. Inc.* | Pliant Systems Inc. | Adv. Fibre C. Inc.* | Yes! Entert. Corp. | Mattel Inc.* |
| Anch. Glass Cont. C. | Owens-Illinois Inc.* | | Alcatel Lucent SA | | |
| | Comp. de S.-Gobain* | | Copp. M. Netw. Inc.* | | |
| | Vetropack Hold. AG* | | | | |
| | Vidrala SA* | | | | |