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Impact of firm characteristics on survival: an empirical analysis in the context of service strategies

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Turning to a service-oriented business model is widely advocated as a means for manufacturing companies to increase their chances to survive and prosper. In this study, we question this general statement by suggesting that the impact of a service orientation on a firm's likelihood of survival depends on the presence of certain preconditions within the firm. In other terms, we ask: what are the differences between failing and surviving service-oriented product firms regarding important characteristics that are intertwined with the deployment of service resources and capabilities?

The study provides the partner companies with analytical insights into this question. In particular, it indicates characteristics that firms should try to protect when they expand into services if they do not want to incur greater risk of failure. We use secondary data and implement a survival analysis and logistic regression method to statistically examine the key differences between two matched samples of failing and surviving service-oriented product firms.

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Impact of firm characteristics on survival: an empirical analysis in the context of service strategies

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Many industrial firms now consider the integration of services into their value offerings as a way to revitalise heavily burdened product businesses and build on internally developed knowledge. Over the past several years, the number of product companies that have entered the service market has grown exponentially (Gebauer et al., 2012; Hombuerg et al., 2013; Kowalkowski et al., 2011; Nordin et al., 2011). Service businesses are especially appealing in capital goods industries, in which pressures from competition, commoditisation and technological innovation are often so high that a strategy based solely on product differentiation is difficult to sustain. Industrial manufacturers and service providers have realised that competitive opportunities can arise outside the products, and even outside the product value chains. A 'service infusion' approach gives access to these opportunities – whose benefits include new revenues, increased profitability, more stable cash flows, market differentiation, and customer intimacy.

As more and more manufacturers upgrade their offerings with services, discussions on the shift from products to services have proliferated in both marketing and operations management. The bulk of this research has implicitly assumed that a service strategy is always beneficial for manufacturing firm performance. It is only recently that scholars have begun to investigate the performance impact of service offerings more systematically. The empirical evidence so far is not as expected. Some studies indicate that the link between service offering activity and firm performance is far more complex than anticipated (e.g. Fang et al., 2008; Gebauer et al., 2012; Kohtamäki et al., 2013a). In addition, researchers point out that the outcomes of service provision are likely to be influenced by contingent factors (e.g. Antioco et al., 2008; Gebauer et al., 2012; Eggert et al., 2011).

The present study concentrates on the role of firm characteristics as contingent factors moderating the relationship between a firm's service offering and its performance. Indeed, the adoption of a service strategy poses a unique challenge: organisational structures, processes, and competences of the firm must be matched with the presence of the service business (Kowalkowski et al., 2011). This implies an intense organisational and capability transformation for firms that evolve from a product-centric foundation (Eggert et al., 2011; Gebauer et al., 2012). Drawing on the resource-based view, we assume that the extent to which firms are capable of identifying and implementing the necessary organisational arrangements for services is a function of firms' characteristics. Firm characteristics reflect the need to acquire new resources and capabilities for service provision. When firms have certain characteristics, the implementation of a service orientation can be facilitated. In turn, with other firm profiles, a more intense effort may be needed to develop service resources and capabilities, and thus the efficiency and effectiveness of service provision may be more difficult to achieve.

Although some suggestions exist of firm characteristics that could mediate the service-performance link, there is little understanding of the topic as whole and almost no consideration for the interplay between different characteristics. The present study defines a set of firm characteristics that are conceptually intertwined with the development of service resources and capabilities, and examines their aggregate effect on firm performance in the presence of a service-oriented strategy.

Prior studies on services in manufacturing have used a small range of designs and methods. In particular, the majority of the extant studies have focused on case study research based on small samples. Expanding the scope of prior research, we propose a comparative study of low- and high-performing firms. While new to service research in manufacturing, this design has been commended and used in other research fields (e.g. Greenley and Oktemgil, 1998; Sheppard, 1994). Our study sample consists of 303 firms that had adopted a service strategy, including 80 firms that declared bankruptcy and 223 matched survivors.

Hypotheses development

Available literature guided the selection of six major constructs that influence the amount of additional resources and capabilities that a firm needs to acquire for implementing a service-orientation: (1) business diversification, (2) service strategy, (3) resource slack, (4) market share, (5) degree of domain initiative, (6) alliance resource diversity. Below we develop research hypotheses about how these six constructs differentiate low- from high-performing service-oriented manufacturing firms and describe the study that explores them.

Business diversification

A firm can leverage the knowledge and resources developed for its goods offering to service extensions. Fang et al. (2008) argue that this is a fundamental advantage that service-oriented manufacturers have on both product only competitors and pure service providers. The knowledge and resources possessed by a firm depend on its level of diversification. A more diversified firm is likely to have a broader knowledge and resource endowment, and thus it will be better able to capitalise on pre-existing capabilities for the deployment of the service offering. Even for firms that may have been into services since their foundation, diversification can facilitate spillovers and synergies between manufacturing and service activities – e.g. sharing of marketing and distribution channels, local offices, customer relationships. Thus, we propose:

H1 Low-performing service-oriented firms are less diversified than high performing ones.

Service strategy

Research has highlighted that a service strategy orientation consists of multiple dimensions (e.g. Antioco et al., 2008). The first dimension considered here is the service volume, namely the proportion of total revenues that results from services. As services become more important in firms' business and revenue models, managers should pay closer attention to their performance and, likewise, have become more experienced in managing service production efficiently and effectively (Suarez et al., 2013). In addition, as the service volume increases, also the benefits from the synergies with the product business are reinforced (Fang et al., 2008). Thus, we propose:

H2a. Low-performing service-oriented firms exhibit lower service volume than high performing ones.

Service strategy orientation can also be associated with the number of services offered. The proactive supply of a broad range of services encourages a positive perception of the value of the offering among customers (Kohtamäki et al., 2013a). As a result, a broad service offering is more likely to support product differentiation and generate sale growth. Thus we propose:

H2b. Low-performing service-oriented firms offer a smaller number of services than high performing ones.

Some services (e.g. maintenance, product upgrade) overlap with the product business in terms of knowledge and resource requirements. Such commonality reduces the need for incremental or dedicated resources for services as well as the problems arising from conflicts or internal tensions between different lines of business. Furthermore, services that are related to the core product business do not require an intense organisational change process (Fang et al., 2008). Thus, we propose:

H2c. Low performing service-oriented firms offer less product-related services than high performing ones.

Resource slack

Several studies have contended that the adoption of a service strategy brings about additional risks for the company. One of the reasons why this may happen is that the development of the service business involves sacrificing resource inputs to the core manufacturing competences (Nordin et al., 2011). Slack resources reflect a cushion of actual or potential financial resources that can be used for innovation and operational improvement. They play a key role in enabling new investments without constraining existing projects. On the contrary, lack of resource slack may originate a negative mechanism that leads the company to expand into services by eroding resources for other important uses. Thus, we propose:

H3. Low-performing service-oriented firms have less resource slack than high performing ones.

Market share

Since services are inherently intangible, customers often struggle both to understand and to compare service offerings from different providers. Customers are more likely to source services from a trusted provider, which implies that the competitive position of the provider is of critical importance (Kohtamäki et al., 2013b). A firm's competitive position will be defined here in terms of its market share. Firms with greater market share have also greater visibility and hence they may be better able to both attract new customers and retain existing ones. Hence, we propose:

H4. Low-performing service-oriented firms have smaller market share than high performing ones.

Degree of domain initiative

To determine a firm's ability to deal with a service offering, it may be important to examine its history. In particular, the degree of domain initiative indicates a firm's dynamism in venturing in new activities. The line of reasoning bringing about this construct is straightforward. We argue that a firm that has a history of being extremely inertial in changing the reaching of its activities will be less able to manage the organisational and capability transformation required by service provision. Hence, we propose:

H5 Low-performing service-oriented firms exhibit a lower degree of domain initiative than high performing ones.

Alliance resource diversity

Operating through service partners is acknowledged as an effective way for manufacturing firms to organise for service provision (e.g. Kowalkowski et al., 2011). Having the competence of using strategic alliances to expand the firm's knowledge and resource base may streamline service provision. On the contrary, lack of such competence is likely to lead the firm to entirely take charge of the service investments and risks internally. Thus, we propose:

H6 Low-performing service-oriented firms exhibit lower alliance resource diversity than high performing ones.

Sample selection

We first gathered a sample of failed service-oriented manufacturing firms from the 'Public and major company database' of bankruptcydata.com. This database includes bankruptcy filings by all firms with at least one public security and $50 millions in assets since 1986. We identified over 2800 firms that filed for Chapter 7 or 11 or otherwise declared bankruptcy until December 31, 2013. To determine if they were adopting a service strategy, we content analysed the descriptive information provided in the firms' annual reports.

Content analysis on corporate reports has been successfully used in previous business research (e.g. D'Aveni and MacMillan, 1990; Montabon et al, 1997). Annual reports offer particularly good indication of the major businesses that a firm engages in, and they fairly reflect the focus of organisational strategy because they outline what upper management believes is important to stakeholders. Service proactive firms will typically make the information regarding service activities available in their annual reports. In turn, if services are explicitly mentioned in annual documents, they are likely to be relevant to corporate strategy. In addition, to date we are unaware of any sources of standardised information on business activities that would fit the needs of our study. Use of content analysis is a logical choice for converting descriptions in annual reports into the information needed for our study. Content analysis is a firmly established methodology to examine written text (Berelson, 1952). It can be argued that this technique enables researchers to filter textual material in a systematic and replicable fashion.

Both literature and practice indicate that manufacturing companies may offer a broad range of services. For the purpose of this study, a set of 13 types of manufacturers' services was developed. This was based on the academic literature, as well as on interactions with industry managers and previous research projects in which we participated. This set of service types was compiled with the intent of capturing the different services that manufacturing companies

have so far integrated into their offerings. The list was checked against the annual reports of a sample of 30 leading service-oriented manufacturers from different industries in order to ensure that the service types were consistent with the level of detail at which corporate activities are described in annual documents. Table 1 displays the 13 service types and provides examples of services in each category. To be included in the study sample, the bankruptcies had to report the offering of one or more of these 13 service types in their annual documents. Clearly, they also must be identified as manufacturing companies.

Table 1 – Types of manufacturers' services

Type of services		Examples
1.	Trading and Distribution Services	Trading, import, brokerage, sale of used assets, distribution, retailing, on-line selling, store operation
2.	Logistic Services	Logistics, transportation, trucking, delivery, warehousing, storage, inventory management, inventory planning, inventory control, packaging, shipping, order fulfilment, material handling
3.	Procurement and Purchasing Services	Procurement, purchasing, vendor management services, sourcing services
4.	Maintenance and support Services	Maintenance, repair, overhaul, rehabilitation, spare parts, accessories, product related education/training, helpdesk, call centre, technical support, standard warranty
5.	Certification and testing services	Certification, testing, inspection, auditing, quality assurance, commissioning
6.	Design and development services	Design, development, engineering, research services
7.	Consultancy Services	Consultancy, business advisory services, process optimization, professional education/training, market analysis, forecasting
8.	General outsourcing Services	Project management, operating services, real estate management (operation/control/oversight), staffing services, fleet management, IT outsourcing, finance/HR/accounting/payroll services, monitoring, data processing
9.	Financial Services	Financing, lending, leasing, rental, insurance, extended warranty
10.	Renewal and upgrade services	Product modification, conversion, enhancement, improvement, upgrade, renewal, refurbishing, reconditioning, retrofitting
11.	End-of-life services	Remanufacturing, recycling, collection, decommissioning, de-installation, dismantling, disposal
12.	Installation and implementation services	Installation, implementation, configuration, integration[1]
13.	System integration	System integration, integrated solutions

A preliminary screening was conducted by examining the company synopsis reports compiled the bankruptcydata.com service, as these include an industry classification and often a brief business description from the pre-filing annual document. We dropped the firms that, on the basis of the synopsis information, could be identified as service (non-manufacturing) companies. For all other companies, we content analysed the annual report (10K, 20F or 10K405 form) filed three years prior to the bankruptcy (i.e. in year t-3) in order to establish whether they met the selection criteria for the sample. Here, the three years time lag was introduced to mitigate the effect of the potential endogeneity of the diversification decision (Singhal and Zu, 2013). Distressed companies may choose to expand into services in the attempt of escaping from bankruptcy failure or, on the contrary, they may decide to shut down their service business so that to concentrate on the traditional manufacturing core.

Accordingly, we have deemed more accurate to consider firm activities before rather than at the time of the bankruptcy filing. The exclusions of the firms that didn't meet the sampling criteria, as well as of the firms whose annual document was not available from 'Capital IQ' or 'Edgar' databases resulted in a sample of 164 bankruptcies of service-oriented manufacturers.

The next step of the research design was to find a set of matched survivors for each bankrupt firm. Potential matches were obtained by scanning the competitors that the firm mentioned in annual reports (e.g. Item 1 of 10K forms) and the list of competitors suggested by Capital IQ. Matched survivors had to meet two criteria: (i) compete with the bankrupt on the product business; (ii) implement a service strategy. The first requirement was defined as having a product mix that overlapped with the one of the bankrupt. Consistent with the bankrupts, the offering of one or more of the 13 types of services in Table 1 was assumed as a proxy for the adoption of a service strategy. The information was drawn from the year t-3 annual reports, and so again a potential matching firm was excluded if the year t-3 annual report could not be accessed. In addition, matching competitors must not have filed for bankruptcy either before or after year t-3 as we sought to ensure that survivors were not in danger of failure. Lastly, we limited the survivor sample to a maximum of five matched competitors for each bankrupt so that none of the bankrupt firms was overrepresented. This yielded a set of 223 matched survivors, covering a final sample of 80 bankruptcies.

Measures

Firm performance. Extant studies on service provision in manufacturing have used several measures for firm performance, including sales growth (Kohtamäki et al., 2013a), shareholder value (Fang et al. 2008), and profitability (Homburg et al., 2003; Suarez et al., 2013). While future research could formulate normative proposals regarding the most appropriate measure to use, the choice inevitably depends on the theoretical approach and empirical context of the study. This study examines the question of what firm characteristics may affect the causal chain between services and performance from a bankruptcy perspective. Hence, we adopted a binary variable to measure firm performance – 1 (failure) for bankruptcy firms and 0 (success) for survivors.

Business diversification. We used the unrelated component of the Entropy index (Jacquemin and Berry, 1979) to capture business diversification. This is a widely used measure of the extent to which firms diversify into unrelated industries. As suggested by Martin and Sayrak (2003), we identified industries by the two-digit SIC system and employed firm sales to assess the importance of each industry. The measure was calculated at year t-3. The data were obtained from the Compustat Historical Segments and Capital IQ databases.

Service strategy. Service volume was measured as the percentage of sale revenues in service business segments (i.e. business segments outside the SIC code range 1011 through 3999) compared with the total sale revenues of the firm. Because the measure was referred to year t-3, the data were the same as for the entropy calculation. The number of services offered was measured by considering whether the firm offered each of the 13 types of services in Table 1. The information was gathered by re-coding the business descriptions in year t-3 annual reports (the first coding had used a dichotomous variable, whereby firms where judged to either offer one or more services or not to offer at all). The data from this coding were also used to determine the offering of product related services. We categorised each of the 13 service types

as related if it required similar knowledge and resources as the product business, or unrelated otherwise. Related services included maintenance and support, certification and testing, design and development, consultancy, renewal and upgrade, installation and implementation, system integration. Trading and distribution, logistics, procurement and purchasing, general outsourcing, financial, end of life services were instead labelled as unrelated. Because the number of product related services is likely to correlate to the total number of services offered, the product related services measure was standardised by taking the number of product related services and dividing it by the firm's (total) number of services measure.

Resource Slack. We used retained earnings to assess resource slack. Retained earnings reflect accounting earnings that are retained by the company to be invested into areas where they can create growth opportunities (Bourgeois, 1981). Hence, our measure of slack conveys immediate slack (Lee, 2012). Since retained earnings can vary greatly relative to the size of the firm, we divided by total sales. Conceptual arguments, as well as previous uses in research on corporate performance, suggest that slack measures need to be lagged (as it takes time to resources to lead to results) and calculated as multiple year averages (to absorb fluctuations) (e.g. Greenley and Oktemgil, 1998). Accordingly, all slack measures were calculated as averages of the five years between t-7 and t-3. We gathered the data for these measures from Compustat, Capital IQ and directly from firms' annual reports.

Market share. Our measurement of market share reflects the firm's market share in its primary industry. We calculated the firm's market share in its primary industry as a percentage of the sum of the market shares of the largest three firms in the industry – i.e. the three firm concentration ratio. In calculating this 'relative market share', as it called, we again employed the four-digit SIC system to identify firms' industry. Sheppard (1994) points out that, because market share is also a measure of firm performance, there might be an obvious link with bankruptcy. For this reason, we captured market share two years before the other independent variables (i.e. at year t-5 rather than t-3). Again, we obtained the data from Compustat, Capital IQ and firms' annual reports.

Domain initiative. Our measure of domain initiative was the sum of three indicators: (1) the number of new four-digit SICs added, (2) the number of mergers and acquisitions, (3) the number of strategic alliances and joint ventures. Because they had different mean and standard deviation, the three indicators were standardises in the one-dimensional measure. All indicators were calculated between years t-10 and t-3 as, again, year t-2 and t-1 were thought to be too obvious part of the bankruptcy failure to be meaningfully included. The SIC data were drawn from Compustat Historical Segments, Capital IQ and annual reports. As for mergers and acquisitions, strategic alliances and joint ventures, the information was obtained from Mergent Online, Capital IQ and SDC Platinum. The rationale for the summative index lies in the need to capture parsimoniously a variety of domain initiatives, each of which alone would give an incomplete portrayal of the firm's activity. To ascertain the extent to which the three indicators shared a common core, we calculated the Cronbach's alpha. The alpha value was of .642, which is acceptable for a newly developed scale (Nunnally, 1978).

Alliance resource diversity. Alliance resource diversity was measured as number of firms outside its industry with which the firm formed strategic alliances in years from t-10 to t-3. The industry was identified by the two-digit SIC code.

Control variables. We included eight control variables in the empirical model: firm size (measured by the natural logarithm total assets), age (measured when the firm - or its match - declared bankruptcy), liquidity (measured by the current ratio), leverage (measured by total debt over total assets), profitability (measured by ROA) and industry profitability (measured by the average ROA in the firm primary industry) – as, according to previous research, these may affect the likelihood of bankruptcy. Here, categorisation of industry was based on the four-digit SIC code. All the control variables were calculated at year t-3, using data from Compustat, Capital IQ, Dun & Bradstreet, Hover's and firms' annual reports.

Results

To test the model, a multiple logistic regression (LOGIT) analysis was employed. According to the correlation matrix, the highest correlation between two independent variables (size and domain initiative) was .58. Despite the low correlation scores, we tested for multi-collinearity using the variance inflation factor (VIF) (Tabanick and Fidell, 2007). The VIF for all of the independent variables was below 2.7 (threshold: 10), suggesting that our model was exempt from multi-collinearity. Results of the LOGIT analysis are displayed in Table 2. The overall model is statistically significant (chi-square=97.05, p=0.000). Three variables appeared to be significant (p<.1) in this model: business diversification (i.e. unrelated entropy), slack resources (i.e. retained earnings / sales), degree of domain initiative. Because LOGIT is based on the analysis of group differences, we also examined paired T-tests comparing each bankrupt with its best performing competitor. To identify such best performing competitors, we relied on ROA and ROE indicators at year t-3.

Table 2 – LOGIT results

Logistic regression				Number of obs = 303 LR chi2(14) = 97.05 Prob > chi2 = 0.0000	
Log likelihood = 126.37508				Pseudo R2 = 0.2774	
Bankrupt	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
ln(assets)	-.3074744	.1073835	-2.86	0.004	-.5179422 -.0970066
age	.0032208	.0043637	0.74	0.460	-.0053319 .0117735
ROA	-.0340622	.0105746	-3.22	0.001	-.054788 -.0133365
liquidity	.0035831	.1061123	0.03	0.973	-.2043932 .2115594
leverage	-.4302699	.1428168	-3.01	0.003	-.7101857 -.1503541
industry ROA	-2.344654	1.698754	-1.38	0.168	-5.674151 .9848439
unrelated entropy	-1.524369	.7418269	-2.05	0.040	-2.978323 -.0704147
share service revenues	1.150219	.8462306	1.36	0.174	-.5083628 2.8088
services	-.028277	.0910018	-0.31	0.756	-.2066374 .1500833
share prod. rel. services	-.3203818	.5388737	-0.59	0.552	-1.376555 .7357911
retained earnings/sales	-.3728382	.1748002	-2.13	0.033	-.7154404 -.0302361
relative market share	1.158292	.9429467	1.23	0.219	-.6898499 3.006433
domain initiative	-.4037651	.2285912	-1.77	0.077	-.8517956 .0442653
alliance resource divers.	.0042101	.0062869	0.67	0.503	-.0081121 .0165323
_cons	1.630576	.8396624	1.94	0.052	-.0151324 3.276284

Results of the univariate tests (not reported here for space limitations) generally reaffirmed the LOGIT results; however some differences emerged. The findings for business diversification closely mirrored those obtained wit the LOGIT analysis, i.e. that the bankrupts were significantly less diversified than their surviving competitors. As for the service strategy

variables, the t-tests reaffirmed no significant differences between the bankrupts and the survivors in terms of share of service revenues and share of product related services, yet they captured a significantly lower number of services for the bankrupts (although the means were very close – 2.825 vs. 3.525). As expected from the LOGIT, the level of slack resources and the degree of domain initiative were significantly lower for the bankrupts. Similarly, no significant difference emerged regarding the level of alliance resource diversity. However, in the t-tests the bankrupts appeared to have a significantly lower market share than the survivors.

In summary, our analysis confirms the direct effect on the failure of service-oriented firms of business diversification, resource slack and degree of domain initiative, as well as no direct effect of alliance resource diversity. Importantly, these effects emerge consistently from both multivariate (group) and univariate (paired) tests. On the contrary, the analysis does not find consistently significant statistical evidence of the direct impact of service strategy and market share.

Discussion and conclusions

Prior research on the service infusion in manufacturing has examined service strategies independently from the overall corporate strategy. Raddats and Kowalkowski (2014) argue that service strategies can have different roles within overall manufacturers' strategies. Our findings indicate that also an influence in the opposite direction is possible - corporate strategy (in particular, business diversification) may increase a firm's ability to adopt a service orientation. We also find that the service strategy doesn't have a significant direct impact on the likelihood of firm's failure. Although it is possible that our data collection method smoothed the service strategy differences among the sample firms, this observation suggests that, without the support of other firm characteristics, the service strategy is important but insufficient to allow firms to escape from failure. This may be particularly important for distressed firms that may consider attempting the shift to services in order to contrast an imminent default.

Our results find evidence of the assumed causality between slack resources and firm performance. It is noteworthy that we used retained earnings, i.e. high discretionary resources, as a measure of slack. According to Sharfman et al. (1988), while manufacturing activities tend to use low discretion slack (essentially inventory and machine capacity), service activities require essentially high discretion slack.

As noted, we find no significant effect of firm's market share – in line with the results of Fang et al. (2008). We introduced market share as a proxy for the visibility and reputation of the company. It can be that such characteristics would be more strongly reflected in other constructs, like proximity to customers, quality of customer relationships and customer satisfaction. Data on these constructs can be gathered, and thus the question can be investigated.

However, perhaps the most striking finding from this study is the impact of the degree of domain initiative. Studies have examined the interplay between service provision and various aspects of the firm, including corporate culture and human resource management (Homburg et al., 2003), product innovation activity (Eggert et al., 2011), network capabilities (Kohtamäki et al., 2013a), relational capital (Kohtamäki et al., 2013b). Yet, to the best of our knowledge, no previously published research has explicitly addressed the history of the firm and its familiarity

with change processes. The study described above indicates that this may be a fruitful area for further examinations.

A final comment concerns the limitations of the study. We consider a set of firm characteristics that have received little theoretical and empirical attention from the bankruptcy research. This lack of attention indicates that it is unlikely that the evidence that we observed is extendible outside the scope of service-oriented manufacturing firms. In addition, we believe that there is sufficient knowledge of the service transition to argue that the study of the bankruptcy of service-oriented firms is likely to require its own perspective. Yet, replicating the same study design on two bankrupts-survivors matched samples of product-only firms could further enrich our findings and probe the robustness of our results.

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