# Business success in software SMEs: Recommendations for future SPI studies

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**Abstract.** There is presently insufficient data regarding the relationship between software process improvement (SPI) and business success, a fact which may reduce process prioritisation in software development in practice. To assist future studies examining the relationship between SPI and business success, we developed a new two-phased approach to examining business. The first phase involves the elicitation of business objectives for the forthcoming year, with the second phase determining the extent of achievement of the recorded objectives. At EuroSPI 2011, we described the two-phased approach in detail and reported on the findings from deploying the first phase of the examination to software developing small- and medium-sized enterprises (software SMEs). In this follow-up paper, we report on the findings from the second phase of the investigation in the participating software SMEs, formulating an additional important new recommendation for future studies.

**Keywords:** Software Process Improvement, Business Success, Software SMEs.

## 1  Introduction

Business processes are the routines or activities that firms adopt in order to conduct their business [1], [2], with various empirical studies demonstrating that business process management has a positive effect on business success [3], [4]. Within software development organisations, the software development process is a large and complex component of the overall business process, and therefore, it follows that software process management should also have a positive effect on business success. One of the principle vehicles of software process management is the domain that is commonly referred to as software process improvement (SPI).

Earlier research has demonstrated that software companies can benefit from SPI programs, including financial benefits, such as return on investment (ROI) [5]. While Van Solingen [5] examined large software development organisations, other research demonstrated that software SMEs can also derive benefits from SPI, including improvements in quality, schedule and budget adherence [6], [7]. However, none of the earlier research has focused on examining the influence of SPI on business success, hence it has been reported that there is a lack of direct evidence of the

business benefits of SPI [8], resulting in some software companies choosing to implement SPI in response to negative business events alone [9]. Therefore, there is a need to conduct studies that investigate the relationship between SPI and business success – and members of the software process and SPI communities would expect that such studies would highlight the important role of SPI in creating competitive advantages and thus in supporting business success. Future studies examining the relationship between business success and SPI will require a robust, thorough and reliable method for making determinations in relation to business success.

In an earlier published work, we identified a new approach to examining business success in software development organisations [10]. Our approach recommended using a two-phased engagement with companies when making determinations in relation to the degree of business success. The first phase identifies the objectives for a forthcoming period (say for example, 1 year), with the second phase returning to the organisation at the end of the period and examining the extent to which the recorded objectives were achieved. In our earlier published paper, we reported on our experience of applying the first phase to seventeen software SMEs, making a number of recommendations for later studies. In this paper, we report on the findings from the second phase of the business success inquiry, extending our recommendations for later studies seeking to examine business success in software development organisations.

The remainder of this paper is structured as follows: Section 2 presents a brief review of the two-phased technique for examining business success in software companies, along with details of the application of the first phase to participating software SMEs. In Section 3, we describe the second phase of the business success investigation, identifying objectives with the highest and lowest degree of achievement. Finally, in Section 4, we present a summary and a conclusion.


## 2 Study Background

This section provides an overview of the business success literature, along with a brief review of the two-phased business success examination. In addition, this section presents a summary of the results from the implementation of the first phase of the examination in software SMEs (more comprehensive details are available in [10]).

### 2.1 Business success in software development companies

The domain of business success, sometimes referred to as business performance, is multi-faceted. Historically, businesses took the view that only financial measures of business success were of importance [11]. Such financial measures include profitability, ROI, and productivity [12-15]. However, the pursuit of profit is not the only purpose that a company must address [16] and a number of other important non-financial measures of business success also exist [17], [18]. Such non-financial measures include customer satisfaction and business process management. Collectively, the financial and non-financial aspects of business success are addressed in multi-dimensional business performance measurement frameworks [19]. A number

of multi-dimensional business performance measurement frameworks have been developed [20-23], with the Balanced Scorecard (BSC) [24] approach being the most popular [25]. Although the BSC has been criticised as being impractical for use in small companies [26-28], it has also been noted that SMEs can obtain benefits by using the components of the scorecard as a frame of reference for implementing business success investigations [29]. The creators of the Holistic Scorecard (HSC) [30] extended the BSC to include specific business success considerations for software development companies (refer to Figure 1).
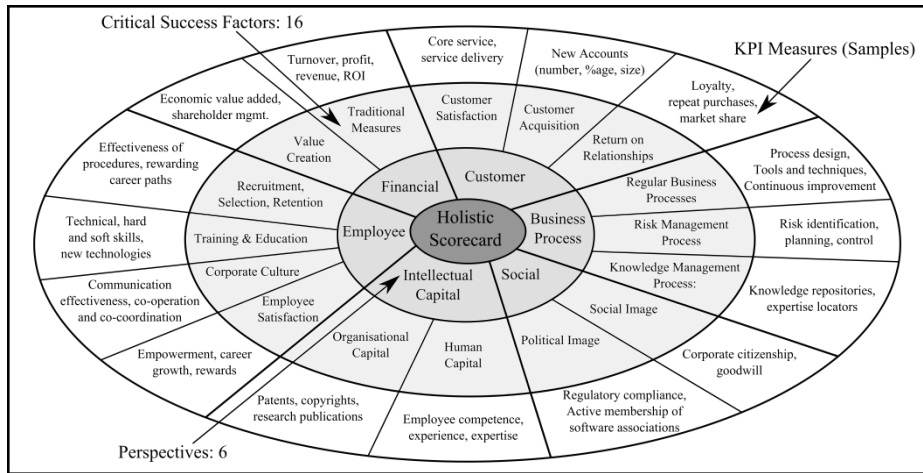


**Fig. 1.** Holistic Scorecard Overview

### 2.2 Examining business success in software SMEs using the HSC

A comprehensive survey instrument was developed using the HSC as a reference framework. In order to minimise the effect of biased or false recollection, a two-phased investigation was designed (refer to Figure 2). In Phase 1 of the investigation, the business objectives are elicited for the forthcoming period. In Phase 2 of the investigation, the extent of achievement of the business objectives is determined.
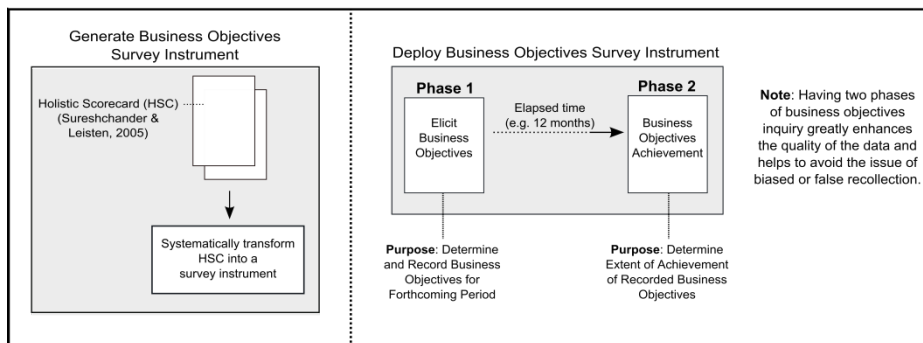


**Fig. 2.** Using the HSC in a two-phased business success investigation

### 2.3 Phase 1 – Business objectives elicitation in software SMEs

The first phase of the survey instrument was deployed to 17 SMEs in January-June 2012. An analysis of the data permitted the development of a hierarchy of business objectives for software SMEs (refer to Figure 3), plus two recommendations for future studies:

**Recommendation 1**. If a future study of business objectives in SMEs were to use the HSC (or the HSC-based survey instrument produced by this research), the researchers could consider removing or consolidating the objectives that are in the lowest tier of the hierarchy in figure 3.

**Recommendation 2**. Future research into the business objectives in software companies should include questions relating to objectives in the areas of (1) financial liquidity (sometimes termed cash flow); (2) off-shoring or outsourcing some aspects of the development work; (3) mergers and acquisitions (M&A).
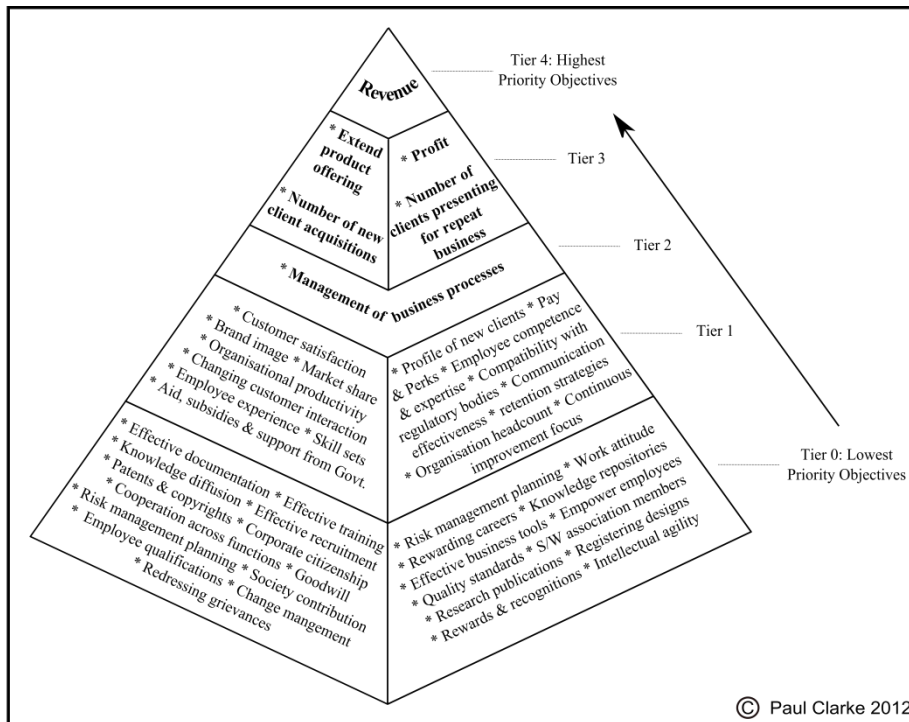


**Fig. 3.** Hierarchy of HSC Business Objectives for Software SMEs

In the following section, we report on the findings from the Phase 2 of the business objectives examination, identifying the extent of achievement of business objectives in software SMEs. Furthermore, we make an additional new recommendation for future studies of business success in software companies.

# 3 Phase 2 – Extent of Achievement of Business Objectives in Software SMEs

In this section, we report on the additional contribution of this paper: the results of Phase 2 of the business success examination in the participating software SMEs. In the period February to June 2011, we returned to the participating organisations, this time discharging the second phase of the investigation – to examine the extent of achievement of the recorded objectives. Two of the participating organisations were unable to participate in the second phase of the investigation, citing business pressures as an obstacle to setting aside time for the interview. Therefore, fifteen companies participated in the second phase of the investigation, with the interview time being approximately 45 minutes per company.

All of the fifteen organisations satisfied the European Commission definition of an SME [31]. Within each of the participating organisations, a suitable participant was identified; most commonly, the interviewee held the job title of Managing Director (though other Director-level job titles were also involved). The participating software SMEs varied in terms of the headcount: 3 of the participating companies had less than 10 staff; 4 companies had between 10 and 19 staff; the remaining 8 companies had between 20 and 129 staff. Predominately, the participating organisations were primarily located in Ireland. However, in some cases, the organisations were mostly located outside of Ireland, in places such as the US and Chile. The participating companies operated in diverse business domains. Four of the organisations developed web-based software, with another four organisations developing software for the telecommunications domain. The remainder of the organisations operated in a variety of different sectors, including, content management, data mediation, and embedded software.

Where possible, the interviews were conducted face-to-face with telephone interviews being employed in a small number of cases (for example, where the interviewee was based in a remote location). Irrespective of whether the interview was conducted face-to-face or via telephone, the interview was (with the consent of the interviewee) recorded and later, the interview recording was carefully examined to ensure that the responses of the interviewee were accurately and completely documented in electronic form. For each of the objectives recorded in Phase 1 of inquiry, the participant was asked to identify the extent of achievement of the objective on a four-point Likert scale (refer to Table 1).

| Achievement Value | Achievement Interpretation |
|---|---|
| 0 | Not achieved to any extent |
| 1 | Partially achieved |
| 2 | Mostly achieved |
| 3 | Totally achieved |

**Table 1.** Achievement Rating Scale for Business Objectives

The data collected in Phase 2 was carefully analysed using both spreadsheets and voice recording analysis. This analysis reveals that there are a number of areas where software SMEs are strong at achieving their business objectives, while there are other

areas where software SMEs are not as successful at achieving their objectives. An overview of the results of our analysis is presented in Figure 4, with the following sections dedicated to evaluating the results of our analysis[1].
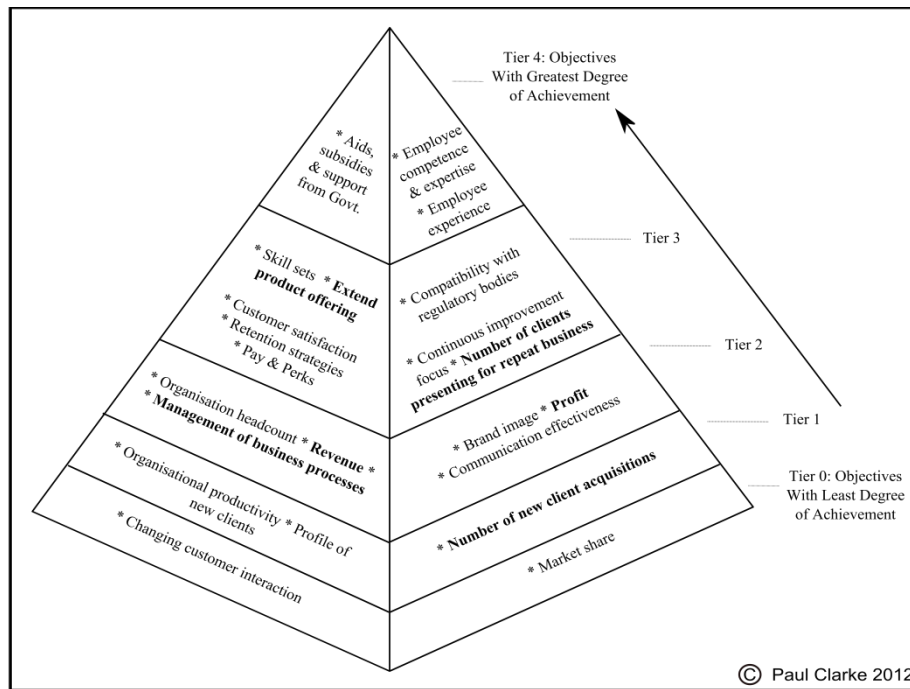


**Fig. 4.** Hierarchy of achievement of HSC Business Objectives for Software SMEs

### 3.1 Objectives with Greatest Degree of Achievement

Having conducted a careful and thorough analysis of the data, we have identified eleven objectives that software SMEs tend to be most successful in achieving. The highest degree of achievement was in respect of the objectives in relation to obtaining aids, subsidies and support from government. This finding was slightly surprising, as in the first phase of the investigation, some of the participating organisations had highlighted that they often had difficulty in obtaining financial support and assistance from government. Perhaps the success in this area is related to the prevailing business conditions at present. With many organisations struggling against a headwind of challenging broader economic conditions, it is likely the case that software SMEs simply have to be as successful as possible in obtaining the maximum possible support from governments.

Our analyses also find that software SMEs are quite strong at achieving their objectives in relation to employees, specifically in relation to the competence, expertise and experience of employees. Again, this could be related to the need for

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[1] Since the initial phase of the study highlighted that software SMEs tend not to have objectives on Tier 0 of the hierarchy of objectives (Figure 3), the analysis herein focuses on Tiers 1-4.

software development companies to obtain the maximum possible value from employees in what are very challenging economic conditions. However, a deeper analysis of this finding demonstrates that in the first instance, the participating organisations did not have particularly strong objectives in relation to employee competence, expertise and experience – the initial objective was related to sustaining a position whereby employees improved their competence, expertise and experience as a natural outcome of working in a fast moving and dynamic SME environment. It is therefore the case that the initial objectives in the area of employees were not strong and were largely concerned with natural outcomes. We encountered a similar experience with employee skill sets, though the extent of achievement for skill sets was somewhat lower than that recorded for competence, expertise and experience. This type of finding was not anticipated when we originally discharged the first phase of the investigation and as a result, we make the following recommendation for future studies:

> **Recommendation 3**. If a future study of business objectives in software companies were to use the HSC (or the HSC-based survey instrument produced by this research), the researchers should take care to ensure that employee-related objectives in the areas of competency, expertise, experience and skill sets are distinct objectives beyond the increasing competency, expertise and experience that are accrued as part of routine working arrangements.

Our analyses also demonstrate that software SMEs are relatively successful when it comes to achieving business objectives in the area of compliance with regulatory bodies. In the case of the participating organisations, a number of the individual companies operated in business domains wherein regulatory compliance was a prerequisite for business – for example, certain telecommunications and confidential data processing systems. Therefore, it is not altogether surprising to discover that the participating SMEs report that in general they have been successful in terms of satisfying the regulatory bodies associated with their business domain. We also found that software SMEs are successful when it comes to extending their product offering. Many of the participating organisations had explicit new features and capabilities that we identified as objectives from the first phase – and in most cases, the participating organisations were successful in implementing the features or products. Of all the high priority objectives identified in the first phase (those objectives on Tiers 3 and 4 of the hierarchy in Figure 3), the participating companies were most successful in terms of implementing new product base or in enhancing existing product base.

We also found that among the participating organisations, companies were reasonably successful in terms of their objectives in relation to customer satisfaction levels and gaining repeat business from existing clients. These two objectives would appear to be related, since if a client is satisfied, they are also more likely to present for repeat business. In relation to employee retention strategies and pay and perks, we found that the participating companies were generally achieving the objectives that they had identified during the initial investigation phase.

**3.2 Objectives with Lowest Degree of Achievement**

While the participating companies were most successful in areas such as obtaining aids, subsidies and support from government, and in terms of extension to product offerings and generating repeat business from existing clients, there are a number of other areas in which the objectives were not as successfully met. Notably, the companies were not quite as successful when it came to meeting revenue and profit targets, or in terms of objectives in relation to the business process. The broad view that we can establish from the analysis is that software SMEs work hard at retaining and extending business with existing clients, but that other aspects of their business objectives become much more difficult to realise. In addition to areas such as revenue and profit, we also found that the participating SMEs are less successful again when it comes to hitting targets for new client acquisitions. These observations highlight some interesting aspects of the software SME sector.

Firstly, none of the participating organisations are listed on a stock exchange and therefore, they are not subject to the predictability of revenue and profit targets that are generally demanded by the markets. As a result, aggressive revenue and profit targets may be set by small company owners – since there is no immediate negative funding impact from failure to achieve objectives. Or perhaps it is also the case that there is not a great deal of oversight of the original financial objectives with a view to tempering them against the whims of the principle agent, the owner. We must also highlight that small software development companies are often involved in market creation and innovative product development – the results from which can be difficult to predict in advance.

Secondly, small businesses are like any other general type of business in one key respect – in that it tends to be less difficult and less costly to obtain new business from existing clients than it is to secure entirely new clients [32]. Once a relationship is established and trust is in place, it is more likely that a customer will be prepared to do business with an established supplier with existing delivery experience. This particular issue could be exacerbated in software SMEs that are trying to convince potential new clients of the benefits of their innovative new product – they may first have to work hard to create the market for the new product, something that is acknowledged as being a significant challenge [33]. We also found in the study that among the participating companies, there was a low degree of success in terms of achieving objectives concerning the profile of new clients. This, we believe, further emphasises the dependence that software SMEs can have on existing clients, and the difficulty that they can experience when trying to attract new customers, especially if the profile of the desired customer base is divergent from the existing customer base. Therefore, small companies may be much more exposed to the demands of a few key clients – something that is further evidenced by the relatively low degree of success that the participating organisations had in terms of changing the nature of customer interaction. One final observation in relation to the difficulty of securing new clients is the fact that the participating organisations were overwhelmingly falling short of the market share objectives that were captured during the first phase engagement.

Our analyses also revealed that the participating organisations were not entirely successful in terms of achieving their organizational productivity objectives. However, while a significant number of organisations expressed objectives in relation

to organizational productivity in the first phase of the inquiry, for the most part these objectives were of the lowest order of priority. Therefore, the achievement (or non-achievement) of organisational productivity objectives would not appear to be significant in the overall scheme of business success for the participating companies. A summarised view of the findings from the data analysis is presented in Figure 4.


## 4 Summary and Conclusions

As highlighted in the introduction for this paper, there is presently a need to examine the role of SPI in terms of supporting business success. Numerous earlier studies have demonstrated that there are benefits to be gained from SPI activities, including improvements to quality, budget and schedule adherence. Despite these noted benefits, it has also been reported that some software development companies can have a low process priority [8], and that software SMEs appear to conduct SPI in response to negative business events [9].

In order to support future studies examining the influence of SPI on business success, we developed a new approach to examining business success in software development companies. This new approach utilises the HSC [30] as a reference framework, ensuring that the broad spectrum of multi-dimensional business performance considerations (i.e. financial and non-financial) are included in the business success examination. Furthermore, the inclusion of employee and intellectual capital related business performance criteria in the HSC ensures that all of the major software development business success considerations are included in our new approach. From the HSC, we systematically derived a survey instrument that is deployed in two phases – Phase 1 determines the business objectives for the forthcoming period (e.g. 1 year), with Phase 2 later examining the extent of achievement of the recorded objectives. The outcomes from discharging Phase 1 in the field, which were presented at EuroSPI 2011 [10], found that the HSC is a comprehensive and useful framework for examining business success in software SMEs. From this exercise, we determined that software SMEs tend to have high priority business objectives in the areas of revenue, profit, extending product offerings, number of new client acquisitions and the number of existing clients presenting for repeat business.

In this paper, we have reported the findings from discharging Phase 2 of the business success inquiry - determining the extent of achievement of the business objectives. Some of the highest priority objectives, including revenue and profit, were not completely achieved which may suggest that the revenue and profit targets of software SMEs are unrealistic. Equally, the participating companies performed relatively poorly when it came to achieving the objectives for new client acquisitions. However, the participating companies were quite successful in meeting the targets for aids and subsidies from government, something that may have helped to address the shortfalls in revenue and profit targets. We also found that the participating companies were relatively successful in terms of extending their product offerings in line with objectives, and that they performed quite strongly when it came to meeting targets for obtaining repeat business from existing clients.

Overall, we find that the HSC is generally comprehensive in nature and appropriate for studies investigating business success in software companies. However, we do make a number of recommendations for future research into business success in software companies. Firstly, we recommend that future studies in software SMEs can consider focusing their business success inquiries on the top four tiers of the SME business objectives pyramid (refer to Figure 3). Secondly, we suggest that a number of new objectives are included in future business success investigations in software companies, including financial liquidity, off-shoring, outsourcing, and mergers and acquisitions. Thirdly, we recommend that future researchers take care to identify objectives that are a natural outcome of working (for example, improvements in experience, skill sets and competencies). The achievement of such objectives are not particularly strong indicators of business success but more a case of extending employee capabilities through regular working activities. Finally, we also suggest that future studies of business success in software companies include a closing question to elicit objectives that have possibly been overlooked by the HSC – a measure that was originally recommended by the creators of the HSC [30].

The authors consider the two-phased business success investigation to be superior to a single stage examination in software SME settings. The risk of false or biased recollection on the part of the participants is greatly reduced and it supports the formal elicitation of business objectives in an environment where they might not otherwise be recorded. However, the approach cannot claim to completely eliminate the risk of false or biased recollection, since it is possible that participants could be biased in their reporting of the extent of achievement of the recorded objectives. Equally, some of the objectives are subjective in nature – such as examining the extent to which improvements in customer satisfaction were achieved. While considerable care was taken to deploy the survey instruments in a consistent and clear fashion (and the researchers had no reason to doubt the feedback from the participants), false, biased and subjective responses do present as potential threats to the validity of our findings.

In conclusion, we believe that the business success investigation approach identified in this research is well suited to examinations of business success in software companies in general. We also believe that there is a need for future research to utilise this approach in an effort to better understand the role of SPI in supporting business success. Future studies that attempt to examine the influence of SPI on business success will require considerable effort, especially since the generalisability of findings can only be established through multi-organisational examinations. However, there is much to be gained from such research and the establishment of a positive association between SPI and business success – through empirical investigation – could transform the views of practitioners with respect to SPI. Rather than maintaining a low process priority and implementing SPI in a reactive fashion, equipped with empirical evidence of the business benefits of SPI, software companies might choose to be more proactive in terms of managing their software development process.

University Business School from whom we received invaluable advice in relation the general structure of the two-phased business success investigation method.

## References

1. Nelson, R.R., Winter, S.: An evolutionary theory of economic change. The Balknap Press of Harvard University Press, Cambridge, Massachusetts, USA (1982)
2. Porter, M.E.: Towards a Dynamic Theory of Strategy. Strategic Management Journal, 12 (1), 95-117 (1991)
3. McCormack, K., Johnson, W.: Business process orientation - gaining the E-business competitive advantage. CRC Press, Florida, USA (2001)
4. Skerlavaj, M., Stemberger, M.I., Skrinjar, R., Dimovski, V.: Organizational Learning culture—the Missing Link between Business Process Change and Organizational Performance. International Journal of Production Economics, 106 (2), 346-367 (2007)
5. Van Solingen, R.: Measuring the ROI of Software Process Improvement. IEEE Software, 21 (3), 32-38 (2004)
6. Sanders, M. (ed.): The SPIRE handbook. better, faster, cheaper software development in small organisations. Centre for Software Engineering Limited, DCU, Dublin, Ireland (1998)
7. Von Wangenheim, C.G., Weber, S., Hauck, J.C.R., Trentin, G.: Experiences on Establishing Software Processes in Small Companies. Information and Software Technology, 48 (9), 890-900 (2006)
8. Baddoo, N., Hall, T.: De-Motivators for Software Process Improvement: An Analysis of Practitioners' Views. Journal of Systems and Software, 66 (1), 23-33 (2003)
9. Coleman, G., O'Connor, R.: Investigating Software Process in Practice: A Grounded Theory Perspective. Journal of Systems and Software, 81 (5), 772-784 (2008)
10. Clarke, P., O'Connor, R.V.: The Meaning of Success for Software SMEs: An Holistic Scorecard Based Approach. In: Proceedings of the 18th International Conference on Systems, Software and Services Process Improvement (EuroSPI 2011), pp. 72-83. Springer-Verlag, Heidelberg / Berlin, Germany (2011)
11. Jennings, D.F., Seaman, S.L.: High and Low Levels of Organizational Adaptation: An Empirical Analysis of Strategy, Structure, and Performance. Strategic Management Journal, 15 (6), 459-475 (1994)
12. Morgan, R.E., Strong, C.A.: Business Performance and Dimensions of Strategic Orientation. Journal of Business Research, 56 (3), 163-176 (2003)
13. Ghalayini, A.M., Noble, J.S.: The Changing Basis of Performance Measurement. International Journal of Operations & Production Management, 16 (8), 63-80 (1996)
14. Ansoff, H.I.: Corporate strategy. McGraw-Hill, New York, USA (1965)
15. Reid, G.C., Smith, J.A.: What Makes a New Business Start-Up Successful? Small Business Economics, 14 (3), 165-182 (2000)

16. Nonaka, I., Toyama, R.: The Theory of the Knowledge-Creating Firm: Subjectivity, Objectivity and Synthesis. Industrial and Corporate Change, 14 (3), 419-436 (2005)

17. Maidique, M.A., Zirger, B.J.: The New Product Learning Cycle. Research Policy, 14 (6), 299-313 (1985)

18. Hart, S.: Dimensions of Success in New Product Development: An Exploratory Investigation. Journal of Marketing Management, 9 (1), 23-41 (1993)

19. Bourne, M., Mills, J., Wilcox, M., Neely, A., Platts, K.: Designing, Implementing and Updating Performance Measurement Systems. International Journal of Operations & Production Management, 20 (7), 754-771 (2000)

20. Lynch, R.L., Cross, K.F.: Measure up! yardstick for continuous improvement. Basil Blackwell, Cambridge, Massachusetts, USA (1990)

21. Brown, M.G.: Keeping score: Using the right metrics to drive world-class performance. Quality Resources, New York, USA (1996)

22. Kanji, G.K., Sa, P.M.: Kanji's Business Scorecard. Total Quality Management, 13 (1), 13-27 (2002)

23. Neely, A.D., Adams, C., Kennerley, M.: The performance prism: The scorecard for measuring and managing business success. Prentice Hall, London, United Kingdom (2002)

24. Kaplan, R.S., Norton, D.P.: The Balanced Scorecard - Measures that Drive Performance. Harvard Business Review, 70 (1), 71-79 (1992)

25. Kennerley, M., Neely, A.: Performance measurement frameworks: A review. Cambridge University Press, IN: Business Performance Measurement - Theory and Practice. Cambridge, UK (2002)

26. Gautreau, A., Kleiner, B.H.: Recent Trends in Performance Measurement Systems - the Balanced Scorecard Approach. Management Research News, 24 (3), 153-156 (2001)

27. McKenzie, F., Shilling, M.: Avoiding Performance Measurement Traps: Ensuring Effective Incentive Design and Implementation. Compensation and Benefits Review, 30 (4), 57-65 (1998)

28. Chow, C.W., Haddad, K.M., Williamson, J.E.: Applying the Balanced Scorecard to Small Companies. Management Accounting, 79 (2), 21-27 (1997)

29. Andersen, H., Cobbold, I., Lawrie, G.: Balanced Scorecard implementation in SMEs: reflection in literature and practice. In: Proceedings of the fourth SMESME Conference, pp. 103-112. Department of Production, 2GC Limited. Aalborg University, 9220 Aalborg, Denmark (2001)

30. Sureshchandar, G.S., Leisten, R.: Holistic Scorecard: Strategic Performance Measurement and Management in the Software Industry. Measuring Business Excellence, 9 (2), 12-29 (2005)

31. European Commission: Commission Recommendation of 6 may 2003 Concerning the Definition of Micro, Small and Medium-Sized Enterprises. 2003/361/EC. Official Journal of the European Union, L (124), 36-41 (2003)

32. Osterwalder, A., Pigneur, Y.: An e-business model ontology for modeling e-business. In: 15th Bled Electronic Commerce Conference, pp. 75-91. (2002)

33. Molina-Castillo, F., Munuera-Aleman, J.: The Joint Impact of Quality and Innovativeness on Short-Term New Product Performance. Industrial Marketing Management, 38 (8), 984-993 (2009)