A Characterization Framework for Evaluating Business/IT Alignment Strategies

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Keywords: Measurement Framework, Evaluation and Analysis, Enterprise Evolution, Modeling, Alignment.

Abstract: In the last years, the alignment issue was addressed in several researches and numerous methods, techniques and tools were proposed. Therefore, a support for choosing the approach that is the most suitable one to a specific need is required. This paper proposes a characterization framework useful for evaluating different alignment approaches, with the aim of discovering similarity, maturity, capability to measure, model, asses and evolve the alignment level existing among business and technological assets of an enterprise. The proposed framework is applied to analyse the alignment research published in the Information & Management journal that that more published on this topic. The achieved evaluation results are presented.

1 INTRODUCTION

The issue of alignment was mentioned for the first time in the late 1970s and since then several studies and researches were conducted highlighting the alignment concerns - Society for Information Management (2006). Nowadays the alignment represents a top concern issue. During the last decade, several studies were proposed by researchers, practitioners and companies, but most of them are at an embryonic stage. They demonstrated through case studies, surveys and empirical approaches that the business and IT (Information Technology) performance are tightly coupled (Chan et al., 1997); (Chan and Reich, 2007); (Kearns and Lederer, 2003); (de Leede et al., 2002), and enterprises cannot be competitive if their business and IT strategies are not aligned. These studies regard different abstraction levels from functional to strategic level (Henderson and Venkatraman, 1993). In particular, Strategic Alignment of IT exists when goals, activities and processes of a business organization are in harmony with the information systems supporting them (McKenn and Smith, 2003). High degree of alignment positively influences IT effectiveness and leads to higher business performance (Croteau and Bergeron, 2001). In (Chen *et al.*, 2008), the dynamic capability perspective is applied to a Taiwanese Semiconductor Company for demonstrating that it is necessary a reconfiguration of IT to support business strategy when misalignment happens. On the other hand at hand, the functional level the analysis of the alignment between existing business processes and software systems is necessary for optimizing the effectiveness of the software support. In literature, different terms are used to refer at the alignment concept: it is called fit in (Porter, 1996); it is also defined bridge (Ciborra, 1997); integration in (Weill and Broadbent, 1998); harmony in (Luftman et al., 2000); linkage in (Henderson and Venkatraman, 1989); fusion in (Smaczny, 2001); and further definition and terms are in (Chan and Reich, 2007).

For being useful and completely applicable, an alignment strategy must include a set of components. The first step to be performed is the modeling of the various entities involved in the analysis and definition of links between business and IT entities. Then, the measurement of the alignment degree existing between the chosen assets is required for establishing if improvement actions are necessary. Then, suggestions for the evolution are required for improving the degree of alignment. An automatic tool is also useful for supporting all the process of detection, assessment and evolution of the considered entities.

To support and address future research concerning the alignment, it is necessary to know the state of the art in this area with a deep investigation of the already executed researches. With this in mind, this paper introduces a characterization

framework including a set of questions aiming at understanding the goal of a proposed alignment approach and its effective applicability to a working context. The definition of the framework followed a careful analysis of the literature considering the alignment topics. This analysis aimed at identifying commonalities and differences among the proposed approaches for being later incorporated in the characterization framework.

The presented study was planned by following the comprehensive guideline that Kitchenham et al. (2009) proposed for performing a systematic literature reviews appropriate for software engineering researchers. Systematic reviews aim at presenting a fair evaluation of a research topic by using a trustworthy, rigorous, and auditable methodology. The proposed guidelines were derived from three existing guidelines used by medical researchers, for conducting a systematic review in clinician field (Pai et al., 2004). Performing the review required the definition of a framework for characterizing alignment studies from the literature. Then, the framework was used for evaluating its applicability to the studies published in the Information & Management journal. This journal was chosen as it is the one that published more research studies regarding the alignment concepts.

The rest of the paper is organized as follow: Section 2 describes the background of the alignment topic; Section 3 describes the proposed characterization framework; Section 4 presents the results of the analysis of the alignment papers published in the Information & Management journal; and final remarks are given in the last section.

2 BACKGROUND

A view of business and technological alignment defines at which degree the information technology mission, objectives, and plans, support and are supported by the business mission, objectives, and plans (Carvalho and Sousa, 2008). Moreover, it involves "fit" and "integration" among business strategy, IT strategy, business infrastructure, and IT infrastructure (Henderson and Venkatraman, 1993); (Papp, 2001). A relevant "problem" is the understanding of what business and information system alignment is, how to obtain it and therefore maintain it (Pereira and Sousa, 2003). Traditional approaches addresses the alignment concern for understanding how organizations can achieve alignment, but little contribution is given regarding how to identify and correct misalignment.

Different models are introduced in literature. One of them was SAM – Strategic Alignment, Model from Henderson and Venkatraman (1993) . Different study were later performed for evaluating these models. For example, in (Avison *et al.*, 2004) the SAM model was used in financial service firms for determining if it was useful to asses strategic alignment between IT and business. In (Bleistein et al., 2006), the general aspects concerning modeling was well debated and a modeling issue was proposed. In particular, the VMOST – Vision, Mission, Objectives, Strategies, Tactics – analysis was treated to split the business strategy into the main components of vision, mission, goals, strategies and tactics, and the BRG – Business Rules Group – model was proposed for modeling the organization's systems. In (De Castro et al., 2011), the MDA – Model Driven Architecture – tool was used to support the alignment management, and meta-models were proposed for representing the entities involved in the alignment analysis. In (Aversano et al., 2010a), a framework was proposed for modeling the alignment at the functional level and some metrics were introduced for measuring the alignment degree between business processes and software systems. In (Etien and Rolland, 2005), criteria and associated generic metrics were proposed to quantify at which extent there is a fit between the business and system which supports it. In (Wieringa et al., 2003), a framework was presented for analyzing the alignment problem and proposing an approach to application architecture design with reference to a business context.

The Business and Information Systems MisAlignment Model (BISMAM), was proposed in (Carvalho and Sousa, 2008); (Thevenet et al., 2006), to understand, classify and manage misalignments. The proposal addresses the alignment problem combining the misalignment approach with medical sciences approaches, based on a metaphor between misalignment and disease. The authors believe that the misalignment approach is closer to organizations real life and that medical sciences approaches provide relevant concepts and techniques for misalignment classification and management.

The research constructs were measured using multi-item scales adapted from the SAM framework (Chen, 2010). The relationship existing between the alignment maturity dimensions and IS strategic alignment was examined and the results were applied to provide a snapshot of business–IT alignment in China. In (Hooper et al., 2010), a new conceptualization of alignment was reported

together with the development and testing of a parsimonious model which addresses this issue. Data from a survey of 415 respondents from medium-large New Zealand companies were used to test the model. It was found that IS-marketing alignment had a positive impact on both business and marketing performances, and that the latter had a modest but positive impact on business performance. This study extended the application of Venkatraman's from (Henderson and Venkatraman, 1989), and offered a support to the robustness of his conceptualization and measurement of strategic orientation.

In (Becker et al., 2008), it was debated that Software Process Improvement (SPI) programs increase the competitiveness of software development organizations. Moreover says that QFD – Quality Function Deployment – is an effective technique that can be used for institutionalizing improvement processes on the basis of the organization's strategic planning (SP). Several studies proposed the use of QFD together with SPI programs. The purpose was to present QFD as an alternative to the strategic alignment of a SPI program. A preliminary evaluation indicated that the use of QFD could help organizations to see better and faster results in their SPI programs.

3 THE CHARACTERIZATION FRAMEWORK

The alignment strategies proposed in literature consider different aspects of the alignment and analyze it at different abstraction levels. The aim of the proposed framework is to understand if an alignment strategy is suitable to an enterprise's specific needs and, in particular, if its description is complete and clear for being easily applying it. The proposed framework was defined for being generally applicable for analyzing any kind of alignment strategy. Then, the main components it considers represent a synthesis of all the aspects covered by the alignment strategies proposed in literature. Specifically, the framework considers the three following main phases (Aversano et al., 2010a):

1. Modeling. All the entities involved by the alignment analysis should be modeled, so to exclude all the business and technological details that are not relevant for the study. This phase is necessary to search and represent the information that the considered alignment approach uses for analyzing the alignment at the considered abstraction level. The modeled entities regarding the different aspects involved in the alignment evaluation should be mapped, so to facilitate the next analysis (Aversano et al., 2010b).

2. Alignment Evaluation. An alignment approach should quantitatively evaluate the alignment degree of the considered entities for objectively analyzing it and understanding if it reaches a satisfying level or improvement actions should be performed for increasing it. This requires the use of suitable and easily quantifiable metrics.

3. Evolution Execution. If the alignment level does not reach a satisfying level, a misalignment in the analyzed entities exists, and evolution actions should be performed and for increasing it.

The proposed characterization framework considers each of the activities cited above by including, for each of them, a section with a set of questions. In addition, the framework includes an initial section of generic questions aiming at categorizing the alignment approach discussed in a considered research paper and capturing the generic information regarding it.

Every question is formulated so that it can be answered by analyzing the documentation of a considered strategy and using the following values:

- Yes, indicating that the information required by the question is clearly and completely described in the analyzed documentation.
- No, indicating that the analyzed documentation does not consider the specific aspect the question concerns.
- Partially, indicating that the aspect indicated in the question is only partially addressed in the documentation.
- Not clear, indicating that the documentation does not clearly describe the information needed for answering the question.
- Not defined, indicating that the documentation does not describe cite the information needed for answering the question.

The following sub-sections describe the four sections of the characterization framework detailing the questions introduced in each of them.

3.1 General Questions

The first top-level questions deal with general aspects of an alignment strategy and aims at categorizing it. Table 1 lists the questions included in this section of the framework. In particular, the questions are formulated for understanding if motivations, needs of the alignment analysis (D1),

and challenges of the considered strategy (D4) are clearly debated. Alignment strategies can analyze this aspect at different levels, involving diverse entities. In fact, regarding the business assets, the strategy can consider: enterprise goals, business entities, business strategies and business processes; on the other side, from the Information Technology point of view, it is possible to consider technologies and information systems (applications and data) (Reich and Benbasat, 2000). These entities are considered at different abstraction levels, and two different levels can be considered: *strategic level* analyzing business strategy and IT strategy, and *functional level* considering business processes and information systems (Henderson and Venkatraman, 1989). Then, the proposed framework also includes questions for understanding these aspects (D2, D3, D5). In addition, the definition of pre-conditions for applying the strategy are investigated, as some information can be missing in the operative context for being able to apply the analyzed approach (D6).

Table 1: General questions.

ID	GENERAL
D1	Are motivations and needs of the alignment strategy treated?
D2	Is the dimension of the considered type of alignment discussed?
D3	Is the concept of alignment defined?
D4	Is the challenges in attaining the treated type of alignment?
D5	Are the entities involved in the considered type of alignment discussed ?
D6	Are the pre-conditions for applying the proposed strategy clearly stated?
D7	Is the proposed strategy scientifically mature?
D8	Is the need of quantitative methods discussed?
D9	Are future perspectives and/or future work proposed?
D10	Are lessons learned discussed?

Table 2: Modeling questions.

ID	MODELING
D11	Are models to represent alignment used?
D12	Are models to represent the separate entities used?
D13	Is the proposed model based on existing research approaches?
D14	Is the modeling automatically supported?
D15	Was the proposed modeling approach applied to case studies?
D16	Was the proposed modeling approach applied on the field?

Furthermore, the initial section of the framework analyses if the strategy was defined by considering previous experiences and underwent to improvement actions (D7), if it included quantitative studies (D8), and if it suggested improvements and extensions in the future (D9). All this helps to understand its scientific maturity; while the experimental maturity is verified by considering the application on the field of the considered approach and knowledge and experience gained through its use (D10).

Table 3: Alignment evaluation questions.

ID	MEASUREMENT
D17	Is a method to measure the level of alignment utilized?
D18	Is the proposed alignment measurement method based on existing research approaches?
D19	Is the alignment measurement method applied to case studies?
D20	Was the alignment measurement method applied on the field?
D21	Are statistical analysis used and the results summarized?
D22	Is the alignment measurement method automatically supported?

Table 4: Alignment evolution questions.

ID	EVOLUTION
D23	Is an approach proposed for addressing and evolving the alignment?
D24	Is the proposed evolution approach based on existing research approaches?
D25	Is the evolution approach automatically supported?
D26	Was the evolution tool applied to a case studies?
D27	Was the evolution tool applied on the field?

Table 5: Classification of the papers.

Type	Paper
Practice	S1,S2,S4,S5,S6,S7,S8,S9,S11,S12,S13, S16,S17,S19
Research	S3, S5, S10, S11, S14, S15, S17, S18
Review	
Survey	

3.2 Modeling Questions

The second section of the framework includes questions dealing with modeling activities. Table 2 reports the included questions aiming at investigating the completeness of the available information regarding the existence of modeling techniques in the alignment approach described in an analysed research study (D11), and the possibility of modeling the elementary entities involved in the alignment analysis and related reciprocal relationships (D12). Moreover, the questions investigate on the maturity of the analyzed modeling approach by verifying if its definition depends on other approaches (D13) and it was already applied to case studies (D15) or working contexts (D16).

3.3 Alignment Evaluation Questions

The third group of questions concerns the alignment

measurement activity. Table 3 presents the questions formulated with the aim of verifying if the approach described in the analyzed paper includes measurement activities and the related description (D17). As the adoption of already existing techniques may contribute to increase the effectiveness of an approach, question D18 considers this aspect; while the subsequent questions (D19, D20) asks if the approach was previously applied for understanding its applicability. Finally, specific questions are defined for understanding the exploitation of statistical methods (D21) and automation level of the proposed approach (D22).

3.4 Alignment Evolution Questions

The last questions of the framework are presented in Table 4 and regards the possibility that the analyzed paper considers evolution activities for managing the alignment of the analyzed entities and to be performed when misalignment happens (D23). Even this group of questions analyzed the maturity and applicability of the proposed approach. In particular, questions on the fact that the definition of the proposed evolution support is based on the current research literature (D24), that it is automatically supported (D25), and it was already applied in operative contexts (D26 and D27) are considered.

4 APPLYING THE FRAMEWORK

The proposed characterization framework was applied for analyzing some alignment approaches selected from the literature. In particular, a full investigation of the research papers concerning alignment was performed. Numerous journal and conference papers were identified. Therefore, it was decided to concentrate the attention on journal papers as they should publish more mature research results. With this in mind, the IEEE, ACM, Springer, Elsevier and Science Direct database were queried. The journal that was discovered to be the most representative of the alignment topic was the **Information & Management** journal from Elsevier. 28 articles of this journal were identified; 5 of them were not available on-line, while 4 papers were discarded as they did not concern the Business and IT alignment. Therefore, the 19 papers listed in the Appendix were considered for being analyzed by using the proposed characterization framework. The paper codes used in the appendix are used in the following for referencing them. The appendix shows that in the considered papers, the alignment problem was faced since 1996 (S1 and S4). In particular, these papers focused on strategic alignment during Business and Information System planning. After publishing these initial papers, the alignment topic were not considered since 2000, and only after 2003, it is possible to observe a growing interest regarding these aspects. Table 5 shows a classification of the papers on the basis of their kind. Four categories were considered: Practice, Research, Review and Survey. The table shows that the papers regard practice and research and no review or survey was found. In particular, the large part of the analysed papers are practical, even if some of them, such as S5 and S17, face the alignment problem from the point of view of the research by proposing new approaches. Before analysing all the obtained evaluation results, the application of the characterization framework is shown in Table 6 reporting the answers collected by applying the characterization framework to paper S11 and the explanation to each answer. The analysis of the answers highlights that the paper concerns strategic alignment. It appears to miss many aspects. In particular, methodologies for supporting alignment modeling, evaluation and evolution are not provided. The paper rather appears to be an empirical study regarding ITI-enabled flexibility, competitive impacts, and organizational moderators of business value. Table 7 includes the answers to all the questions coming from the application of the characterization framework to the analysed papers. The table uses: “part” for the partially answer; *ndef* for the “not defined” answer; and *ncl* for the “not clear” answer. For the sake of clarity, the “yes” and “part” answers are shadowed. Table 7 shows that no paper describes an approach including all the activities considered in Section 3. All the papers provide general information regarding the proposed approach even if they very often do not include sufficient details for understanding its usefulness, maturity, advantages and future perspective. Table 8 includes the distribution of the analysed papers with reference to the considered dimension. The large part of the papers considers the alignment at the strategic level and only some at the functional level.

Some approaches, such as S3, S15 and S17, consider both levels, strategic and functional. All the papers, but S17, describe the entities involved in the approach they propose, as shown in Table 9. It can be noticed that the large part of the proposed approaches considers business entities, with particular reference to business strategies and processes; while, few of the analysed approaches also consider the IT components.

Table 6: Results from the analysis of papers S11.

General questions	
D1	**yes:** Business, public, and governmental organizations confronted with time and other pressures must adjust their strategies, but change cannot be accomplished unless the IT Infrastructure (ITI) is accommodated in an efficient and effective manner.
D2	**yes:** Strategic Alignment
D3	**No**
D4	**yes:** As ITI investments are not always guided by current business needs, efforts to extend ITI should consider how flexibility is introduced into each of its elements and how they are interrelated. The approach therefore identifies the sources of flexibility and their interrelationships and find how they are related to the perceived IT value.
D5	**yes:** The entities involve are: technical ITI elements, human ITI elements, process ITI element
D6	**not defined**
D7	**No**
D8	**No**
D9	**No**
D10	**yes:** The identified lesson learned brought to the identification of three limitations of the approach: such a research design only establishes associations between constructs, whereas causality must rely on theoretical justification; although organizational IT users may find the evaluation of ITI resources and capabilities difficult, their perspective is necessary to identify gaps in different perceptions of ITI; the dynamics of longitudinal processes cannot be analysed using this methodology.
Modelling questions	
D11	**yes:** The approach just hypothesized the use of research model
D12	**No**
D13	**not clear**
D14	**No**
D15	**yes:** Empirical study
D16	**No**
Measurement questions	
D17	**No**
D18	**No**
D19	**yes:** Web-based survey
D20	**No**
D21	**yes:** SEM - Structural Equations Models- techniques and MLE - Maximum Likelihood Estimation (MLE), one-way ANOVA, CFI, ComparativeFit Index, RMR, Root Mean square Residual, RMSEA, Root Mean Square Error of Approximation, Chi-square, AGFI adjusted GFI(Goodness-of-fit)
D22	**No**
Evolution questions	
D23	**No**
D24	**No**
D25	**No**
D26	**No**
D27	**No**

Table 7 shows that few papers include evaluation activities, and this shows that few attention is paid to the measurement activities. The approaches considering this aspect often base their solution on existing approaches. In particular Table 10 includes the main measurement approach adopted. STROEPIS – Strategic Orientation of the Existing Portfolio of IS applications – is a measurement model based on the STROBE – Strategic Orientation of Business Enterprises – instrument. It is useful to model IT strategies and uses the same eight dimensions of STROBE. In (Chan and Reich, 2007) , the authors characterized the strategic alignment as the fit between STROBE and STROEPIS. The Balanced scorecard (BSC), used in S9, translates an organization's mission and strategy into a comprehensive set of performance measures that provide the framework for a strategic measurement and management system. It measures organizational performance across four balanced perspectives: financial, customers, internal business processes, and learning and growth. The BSC enables companies to track financial results, while simultaneously monitoring progress in building the capabilities and acquiring the intangible assets they need for future growth. On the other side, many papers present empirical studies and Table 11 lists the approaches used in the statistical analysis performed by the researchers presented in the considered papers. Actually, even Table 13 indicated that many papers pay attention to the execution of empirical activities. They are very often conducted for analysing some trends and situations in a set of analysed organizations. Among the used statistical approach, SEM – Structural Equation Modeling – is a statistical technique allowing the researcher to test hypothesized direct relationships between independent and dependent variables, such as multiple regression, and allowing the testing of indirect or mediated relationships between observed and unobserved latent variables while examining the reliability of the items to the latent variables. LISREL – Linear Structural RELations – is the most general program that is available for estimating structural equation models. It can be used to analyze data from survey, experiments, experimental designs, and longitudinal studies. It allows one to test the goodness of fit of models, to diagnose problem with models, to fix or constrain model coefficient, to do multiple-group analyses, to estimate means and intercepts as well as slopes, and most importantly, to distinguish consistently between latent concepts and observed indicators.

The analysed papers also give importance to the modelling activities. Many of them are based on already existing modelling approaches. Table 12 describes the used techniques with reference to the paper using them. Many papers considers the SAM – Strategic Alignment Model – model (Henderson and Venkatraman, 1989). It is useful to treat the IS strategy alignment and becomes a support for a

Table 7: Results of the analysis of the considered papers.

	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18	S19
D1	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	part	yes
D2	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
D3	no	no	yes	no	yes	yes	part	part	part	yes	no	no	part	no	yes	no	part	no	no
D4	no	no	yes	part	yes	yes	yes	yes	yes	yes	yes	part	part	part	yes	yes	yes	no	yes
D5	yes	yes	yes	yes	part	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes
D6	yes	yes	par	part	yes	yes	no	yes	yes	yes	ndef	part	no	part	ndef	no	no	yes	ncl
D7	yes	no	ncl	yes	yes	yes	no	yes	part	yes	no	no	yes	no	ndef	yes	yes	yes	no
D8	yes	no	yes	part	yes	yes	no	part	yes	yes	no	part	yes	no	ndef	no	part	no	ndef
D9	yes	part	no	no	yes	yes	no	no	no	no	no	part	no	yes	ndef	no	yes	part	no
D10	yes	no	ncl	no	no	yes	no	yes	no	yes	yes	no	yes	yes	yes	yes	no	no	yes
D11	yes	yes	yes	no	yes	yes	no	no	part	yes	yes	no	yes	yes	yes	yes	no	yes	yes
D12	no	no	yes	no	no	yes	no	no	yes	yes	no	no	yes	no	no	yes	no	no	no
D13	yes	yes	ncl	no	no	yes	yes	no	yes	ncl	ncl	no	yes	yes	yes	ncl	no	no	no
D14	yes	yes	no	no	no	no	part	no	no	no	no	no	no	no	no	no	no	part	no
D15	no	yes	yes	no	no	yes	no	no	no	no	no	no	no	yes	no	no	no	yes	no
D16	yes	no	yes	no	yes	yes	yes	no	yes	yes	yes	no	yes	no	no	yes	yes	no	yes
D17	no	no	yes	no	yes	no	yes	yes	yes	yes	no	no	no	no	no	no	no	no	yes
D18	no	no	ncl	no	yes	no	no	yes	yes	yes	no	no	no	no	no	no	no	no	ncl
D19	no	no	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
D20	no	no	yes	no	yes	no	yes	yes	yes	yes	yes	yes	yes	no	no	yes	yes	no	yes
D21	no	yes	part	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	yes	no	no	yes
D22	no	no	yes	no	yes	no	yes	no	no	yes	no	no	no	no	no	no	no	no	no
D23	no	no	yes	no	part	yes	yes	yes	part	yes	no	no	no	no	no	no	no	no	no
D24	no	no	part	no	yes	yes	yes	yes	yes	ncl	no	no	no	no	no	no	no	no	no
D25	no	no	part	no	part	no	yes	no	no	no	no	no	no	no	no	no	no	no	no
D26	no	no	yes	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no	no
D27	no	no	yes	no	yes	yes	no	yes	yes	yes	no	no	no	no	no	no	no	no	no

collaborative process between the business strategy, business organisation, IS infrastructure, and IT strategy, at two different abstraction level of the alignment: functional and strategic. The Path model is used to organize different variables. In particular, in S9, hypotheses are considered, having as a starting point the importance of the strategic alignment, and motivations and success of the ERP projects. The model captures the relationships between the degree of success of ERP projects, the associated business process changes, and subsequent internal efficiency benefits. Then, it captures the impact of internal process efficiency on customer and financial benefits. Paper S10 adopts the gestalt research model considering a perspective of fit, and looking at a large number of variables that collectively define a meaningful and coherent slice of organizational reality. The Business rules services model is considered in S14. It provides high level services and functions that evolve during the maturity and expanded the scope of the business rules deployments across an enterprise. The Business Rules Deployment Maturity Model identifies maturity along five dimensions, including organizational scope, ownership, structure, development responsibility, and implementation responsibility. In addition, many analysed papers define their own measurement approach.

Table 7 shows that few papers (just S3, S5, S6, S8, S9 and S10) deals with the evolution the considered entities. This demonstrated that the attention is nowadays more concentrated in knowing what alignment is and how to manage it.

Finally, many papers apply the proposed approach as indicated in Table 13. The main attention is paid to applications on the field and empirical studies.

Table 8: Distribution of the papers with reference to dimension.

Dimension of alignment	Paper
Strategic	S1, S2, ,S3, S4, S5,S6, S7, S8,S9, S11, S12, S13, S15, S17, S19
Functional	S3, S14, S15, S16,S17, S18

Table 9: Involved entities.

Involved Entities	Paper
Business Strategy	S2, S5, S8, S7, S9, S10, S13,S19
IT strategy	S2,S5, S8,S10,S13
IT investment	S8,S13
Business performance	S7, S8,S19
Business Structure	S10
IT Structure	S10,S13
Business process	S3, S13, S15
Organization's structure	S13
Human resource	S15
ERP Strategy, Time cost, Financial Benefits	S9
Critical success factor	S3
IT systems	S3,S5
Business objectives, E-business performance, E-commerce strategy, E-commerce strength and opportunities	S19
Business rule	S14,S15
Service systems	S14
Environmental uncertainty, Information intensity, Business dependence on It, IT participation in Business Planning, IT Plan, Business Plan, Competitive advantage	S16
IS managers, Systems development methodologies	S17
Goal (enterprise level), Functional (scenario level), Data, Output misfits (activity level)	S18
IS Strategy, Corporate Strategy	S1
Organization's IS	S7
Technical elements of IT Infrastructure, Human elements of IT Infrastructure, Process elements of IT Infrastructure	S11
IS/IT manager, Business manager	S2
Infrastructure, Application	S5

Table 10: Used measurement approaches.

Measure	Paper
STROBE, strategic orientation of business enterprises	S7, S8, S9
STROEPIS, strategic orientation of the existing portfolio of IS applications	S7, S8, S9
BSC, Balanced score card	S9
Other	S5

Table 11: Considered statistical analysis approaches.

Statistical Analysis	Paper
ANOVA, One-way analysis of variance	S10,S11,S19,S4
CFI, Comparative Fit Index	S6,S7,S11,S13, S16
NNFI, Non-Normed Fit Index	S7,S13,S16
Satorra–Bentler (SB x2/d.f.)	S13
RMR, Root Mean square Residual	S6,S7,S11,S13, S16
RMSEA, Root Mean Square Error of Approximation	S6,S7,S10,S11, S13,S16
Correlations	S10
Error variances	S10
GIF, Goodness-of-Fit Statistic	S6
ROA, average Return-On-Assets	S12,S19
ROS,PNP	S19
TLI, Tucker–Lewis Index	S16
Chi-square	S6, S10,S11,S16
Chi-square/d. f.	S6,S7,S16
AGFI adjusted GFI(Goodness-of-fit)	S7,S11
LISREL (linear structural relations)	S7
SEM technique is a statistical Structural equation modeling	S11
Two-tailed F-test	S2
Other	S5,s17

Table 12: Used modelling techniques.

Model	Paper
SAM Strategic Alignment Model	S1,S2, S6,S15
Path model	S9
Gestalt model of strategic alignment	S10
Business rules deployment maturity model	S14, S16
Business rules tasks/services model	S14
UML model	S18
Other	S3,S7,S11, S13,S19

Table 13: Application of the proposed approach.

Type	Paper
Case Study	S2,S3,S14,S18
On the field	S1,S3, S4,S5,S6,S7,S10, S11,S12,S16,S19,S13
Empirical Study	S1,S4,S5,S6,S7,S8,S9,S10,S11,S12,S13,S16,S17,S19
Example	

5 CONCLUSIONS

The alignment between business and information systems assumed a growing relevance in the last years. This research issue was addressed in several researches proposing numerous methods, techniques and tools. This paper proposes a characterization framework to characterize different approaches, with aim of discovering similarity, maturity, capability to measure, model, asses and evolve the alignment.

This kind of investigation is aimed to support and address future research concerning the alignment. Indeed, it is necessary to understand which are the aspects considered in the literature of this area with a quantitative approach. Because the field of alignment is wide and concerns different aspects, the aim of the presented study is to help practitioners, students and researchers to focalize the attention on a particular interested issue.

The proposed characterization framework was applied to the research works regarding the alignment topics published in Journal Information & Management, and the results of the evaluation is presented. The results for this preliminary application of the characterization framework emphasize that the modeling, measurement and evolution phases of an alignment approach are not adequately addressed in the analyzed strategies. Obviously, besides the Journal Information & Management, many other sources of alignment approaches exist and the results obtained in this preliminary study need the confirmation of a wider investigation involving more and more research approaches. This will be one of the main future work on which the authors are working.

As further future work, the framework proposed can be used to make a survey of the studies presented in the literature, and understand how to better address the research issues in the alignment area. The aim will also regard the classification of different model, measurement, and quantitative approaches addressing the alignment issue at different abstraction level, and understanding which of them better address a specific alignment problem.

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APPENDIX: THE ANALYSED PAPERS

Considered papers from Journal Information & Management – Elsevier

S1. Baets, W. R. J.: Some empirical evidence on IS Strategy Alignment in banking. 30(4), pp.155-177, July 1996
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S10. Bergeron, F., Raymond, L., Rivard, S.: Ideal patterns of strategic alignment and business performance. 41(8), pp.1003-1020, November 2004
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S16. Kearns, G. S., Lederer, A. L.: The impact of industry contextual factors on IT focus and the use of IT for competitive advantage. 41(7), pp.899-919, September 2004.
S17. Huisman, M., Iivari, J.: Deployment of systems development methodologies: Perceptual congruence between IS managers and systems developers. 43(1), pp.29-49, January 2006.
S18. Wu, J., Shin, S., Heng, M. S. H.: A methodology for ERP misfit analysis. 44(8), pp.666-680, December 2007.
S19. Kearns, G. S.: An electronic commerce strategic typology: insights from case studies. 42(7), pp.1023-1036, October 2005.