Bridging Operational, Strategic and Project Management Information Systems for Tactical Management Information Provision

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Abstract: Tactical Management is a distinctive managerial function that needs to be delineated both in the managerial and information systems sense. This research of literature investigates current types of managerial information systems in order to evaluate the various manners tactical management is addressed. Ongoing research supports us to pursue a goal of properly defining Tactical Management, its characteristics and distinctiveness from the Operational, Strategic and Project Management; but also its connection points and overlapping collaboration areas with these managerial functions. This ought to provide proper basis for recognizing the information system requirements for tactical management and shed light on what should and can be done differently, in order to align the tactical management business profile and needs with the information provisioned by managerial information systems. Given that Tactical Management needs adaptability to changing context (organizational and environmental); is facing the complexity of issues of different nature to be dealt with; communicates with widest scope of stakeholders, entities, processes and developments to be informed about; faces a variable set of diverse incoming and outgoing information flows whose mismatch needs to be addressed; and last but not least, should be able to perform system design, prior process design and management. This research reaches several important findings in the direction of under-addressing of tactical information needs by current types of managerial information systems; ingestion or assimilation of the tactical managerial level of decision-making by operational or strategic management; attempts to automatize the handling of mismatch of incoming and outgoing information; strive for real-time information environments; divided tendencies towards providing adaptability or predictability to the management; diverse ideas for context capturing and treatments of tactical management as process or system. The implicit purpose of the research is to attract attention to tactical management, its importance that can bring substantial competitive advantage to the businesses, and the incremental potential tactical management will realize when being accordingly supported by the information systems of tomorrow.

Keywords: tactical management, sense-and-respond framework, adaptability, information systems, requirements engineering

1. Introduction

"Tactics play a crucial role in determining how much value is created and captured by firms" (Casadesus-Masanel et al. 2009). It is important to define and explore it in details, in order to be able to point out its managerial distinctiveness as well as similarity with the operational, strategic and project management; and the mutual connecting points and dependencies. There is hard time behind doing the tactical management job, trying to coordinate, translate and/or align operations/strategy, details/summaries, management/employees, clients/company, manual/automatized information systems, human, technical, business, … aspects of work. The translation and alignment of the mismatch of all these signals, especially observed from the point of view of the person, is highly complex, diverse and changeable, and should be addressed properly. In the continuing challenges for sustainable information systems, Loucopoulos et al. (Loucopoulos et al., 2006) observe the aspects of ecological complexity – perceiving the double sided nature of the companies and the information systems as complex socio-technical systems; product complexity; project management – for getting the wrong requirements and not focusing on the outcome of and information system engineering and implementation; and education. The successful performance of the tactical management function differentiates the success of the company throughout the time, and it is person- and company- specific. Defining and embedding processes and structures in the organization that enable both business and IT people to execute their responsibilities in creating value from IT-enabled business investments (De Haes and Van Grembergen, 2015) is a current tendency on the side of the researchers and practitioners, also supported by standardization (such as ISO 38500 – the International Standard for Corporate Governance

of IT, ISO 31000 – for Risk Management (ISO, 2015)). This motivation is fueling numerous theoretical contributions and business solutions – however the connection points are sporadic, especially when the entire organization or the widest stakeholder structure is observed (Van Grembergen et al., 2015).

This research of literature aims to point out current Information Systems contributions in terms of concepts, approaches, artifacts and implementations with regards to Operational, Tactical, Strategic and Project Management, through the lens of Tactical Management distinctive needs – with the aim to reveal the tactical management specific information system needs and to make visible the junctures where tactical management bridges with operational, strategic and project management. Our standpoint is that tactical management is distinctive from other managerial functions with the:

- High need for adaptability to changing context (organizational and environmental)
- Complexity of issues of different nature to be dealt with
- Widest scope of stakeholders, entities, processes, developments to be informed about
- System design approach, prior Process flow
- Variable set of diverse incoming and outgoing information flows that can't always be predefined, and whose mismatch needs to be addressed

Hence, the tactical management need for information systems is very specific, and can't be satisfied only with cascading goals, reports and automatized processing logic. It needs theoretical specification, relevance confirmation by real-business research, and special provision by the information systems. The direction is towards individualized extraction and combination of inputs, dynamic processing logic, immediate environmental and organizational context capture and customizable outputs in terms of information. It also needs continuous revising of the context to be able to sustain towards an outcome in changing context – in order to capture earlier the relevant impulses and have a mechanism for proper response (Welsh et al., 2011). We are in favor of "heterogeneous requirements engineering" (Lyytinen et al., 2006) in order to avoid social or technological reductionism in sustainable addressing the tactical management function with information. In terms of business pursuit for an "end" (strategic guidelines, KPIs, targets, goals), it is generally a 'given' variable. In terms of operations, the prescription of business processes, the pursuit for efficiency and optimization, gives throughout the time (year(s)) certain rigidity and repetitiveness in their existence. However, in terms of tactical management, there are numerous and various in nature specific aspects to be taken care of, while pursuing a goal, with somewhat fixed operational inputs, in terms of alternative paths and adaptations to a very dynamic and generally uncertain (Schwabe, 2014) and/or unpredictable environment.

In the highly dynamic business world, one should 'know earlier' the most quiet peripheral signals that may shape the future of the work – but that is possible only if one points a radar towards them. From this narrative, we would like to point out the tactical manager's duty - to continuously properly position the sensing of information (Sense), and align the mismatch of information received (Interpret) processes and actions (Decide), with some reasoning and maneuvers to translate them in order to provide and control the right path to fulfillment (Act) – SIDA loop (in the Sense-and-Response Framework, (Haeckel, 2004)). This SIDA loop is perceived as the perpetual engine to adaptability, if continuously run to revise the context (both organizational and environmental). Such capturing of context is of utmost importance for the lens of this research – with the aim not to suffer from the discrepancy between design-time and run-time (Zdravkovic, 2013) states of the socio-technical system being managed. The SIDA loop is also enabling more precise mapping of the Information System needs for tactical management, that differ in manner of obtaining, frequency, content, and many other aspects.

We see the tactical management as a very important and flexible crossroad that should be able to trace a number of alternative paths for the existence of any business. This specific nature of tactical management does need specific addressing with Information Systems and with Managerial Concepts. The organization of the paper is as follows: firstly, we are delineating tactical management from the other managerial functions; after which, brief definition of the concepts used as baseline, the research strategy and criteria according which the subject papers have been filtered, are explained. The analysis performed upon the research categories and interpretation of results and conclusions are given in the last section.

2. Tactical Management Definition and Characteristics

We are introducing the managerial background of the Tactical Management in order to point out how the business foundation of tactics is paving the way for proper Information System requirements and appropriate provisions.

One definition of tactics, even though modestly present in literature, stated by Merriam-Webster dictionary, is as follows: (a) the science and art of disposing and maneuvering forces in combat; (b) the art or skill of **employing available means** to **accomplish an end**; (c) **a system** or mode of procedure"; deriving from Latin 'tactica', from Greek 'taktika' meaning 'fit for **arranging**, to arrange, place in battle formation' (Merriam-Webster). When removing the military context, the important words in this definition are – disposing – positioning, influencing, persuading, ruling ; maneuvering; skill – managerial; employing available means – using and capturing the current context; to accomplish an end – to reach a goal; a system; mode – approach; arranging and re-arranging.

In our working definition we perceive tactical management as the managerial function on **How** to achieve what is **expected** by **utilizing** what is **given** and following certain **governing principles** in the **current context** of the **organization and environment**.

The elements of the definition can be rearranged with reference to the other managerial functions:

- **How** to achieve (tactics)

- what is **expected** (strategy)

- by **utilizing** what is **given** (operations)

- and following certain **governing principles** (strategic guidelines)

- in the **current context** of the **organization and environment** (tactics)

As it is visible from the definition, the tactical management is expected to maneuver with numerous 'givens' – that may change and are changing. The context is also dynamic and to some extent unpredictable, be it the immediate environment, or the organizational context – the purpose, priorities, governing principles, expectations. The socio-technical system being managed is dynamic and unpredictable. We are recognizing that the department, the team, the organization it is a Complex Adaptive System (CAS) (Holland, 1996) that a manager needs to guide towards a goal, which is specific and unpredictable (Janssen, 2015), to begin with. These requirements imply that Tactical Management should have the adaptability as integrated characteristic in the behavior of the manager and in the information system design, in order to perform successfully, throughout time.

The current managerial literature for **strategic management** is diverse and abundant. The main concepts integrated in the literature are effectiveness, organizational alignment, governance, competitive advantage. Strategic managers are assisted with conceptual frameworks and contributions such as the the Balanced Scorecard (Kaplan et al., 2007), Triple Bottom Line (Elkington, 1997), the Performance Prism (Neely et al., 2002), Skandia's Navigator (Edvinsson, 1997), Intangible Assets Monitor (Sveiby, 1997), The Tableau de Bord (Epstein et al., 1997) (Bourguignon et al., 2004) (Pezet, 2009), The Performance Measurement Matrix (Keegan et al., 1989), the Strategic Measurement and Reporting Technique Pyramid (Lynch et al., 1991), The Results and Determinants Framework (Fitzgerald et al., 1991), The Input-Process-Output-Outcome Framework (Brown, 1996), Objectives and Key Results, the Performance Wheel (McNair et al., 2009) and numerous others. These theoretical approaches offer strategic mapping, balanced measurement systems, financial and non-financial dimensions of organizational performance, qualitative and quantitative information, and appropriate scorecards and even dashboards that enable key indicator monitoring and decision making.

The **operational management** is also receiving valuable attention with managerial as well as Information System contributions. In the managerial literature, the key elements are efficiency and business processes. The non-exhaustive list incorporates managerial methods and techniques such as Six Sigma, Total Quality Management, Lean Six Sigma (Tennant G., 2001), Statistical Process Analysis, Statistical Process Control, Agile (Meyer, 2014), and others.

The **tactical management** dilemmas for key concepts in managerial literature are effectiveness vs. efficiency, outcomes vs. outputs, system design vs. process design. There is scarcity of managerial methods and techniques related to tactics – and, this investigation aims to prove that the same situation reflects in the support for tactical management in terms of information systems, too. On the side of the tools and techniques, actively used are Network Planning, Realistic Scheduling, Accurate Estimating, Work Breakdown Structure, Product and Project Lifecycle. Tactical Management is mostly supported in Project Management literature – with the well-established concepts of PMBOK (Project Management Institute, 2004), Scrum, Prince 2, Agile Project Management, Management of Value and others. However, the tactical management as continuous function has distinctive characteristics from the project management function, so to some extent the project management literature is addressing but not completely covering the tactical management needs.

The intersections of the Tactical Management function with the operational, strategic and project management functions (discussed in our definition), stress the junctions where tactical management connects these functions in the socio-technical system of an organization. The distinctiveness of the Tactical Management function from the operational, strategic and project management functions (discussed in the Introduction), points out how it needs to be addressed with Information System provisions.

3. Research design

3.1 Concepts in the research

With the abovementioned Tactical Management definition and characteristics in mind, we have performed a theoretical research in order to get deeper insight in the support that the tactical management is having at this point in time, with broad information systems artifacts, frameworks, methods and tools. To be more specific, the literature research was guided by the following questions: (1) understanding of the essence of the paper, the proposed contribution and its integration in management per level (Operational, Tactical, Strategic, Project) and the proposed combinations; (2) analyzing the specific information and processing input for Tactical Management, depending on the used Tools, Methods, Approaches, Artifacts; (3) detection of how the proposed artifact takes in consideration (used the term "closing" with) an End – may it be performance measurement framework, such as Balanced Scorecard, Triple Bottom Line, … or Business Plan, KPIs, Goals, Targets, Reason for Being, Purpose, Accountability; (4) how the work handles the mismatch of the information for tactical management; (5) the prescription of Real-time or tactical management specific Right-time information need; (6) The presence or absence of Sense-and-Respond Framework and the adaptability loop (such as Sense-Interpret-Decide-Act (SIDA) Loop); (7) the support for Adaptability (8) the perception of Predictability in the specific approach (9) the Context capture approach and (10) the artifact's underlying focus on System Design, Process Design or both.

3.2 Research strategy

The background idea that is guiding this research is to detect the provisions of adaptability i.e. and Information System requirements for tactical management.

The initial stage of the research was performed on 350 theoretical contributions obtained from EBSCO database; Web Of Science Listing of high ranking Information Systems journals, Google Scholar engine; Research Gate Portal; searched with the keywords: information systems, management information systems, tactical management information system, operational management information system, strategic management information system, project management information system, business and IT alignment; decision support systems; enterprise architecture, enterprise ontology, business process modeling, business modeling. Also, snowballing technique was used, cross-checking and expanding the search with referenced publications in the initially selected works. This literature review investigates in-depth 25 theoretical contributions published in the time frame of 2004-2015 that are offering information systems artifacts, implementations and knowledge to the operational, tactical, strategic and project management, using various foundations technologies and combinations, and from different viewpoints. The selection of 25 papers out of 350 was performed according specified inclusion and exclusion criteria. As initial step, we recognized the widest foundations for positioning the information systems foundations in the categories Enterprise Architecture, Enterprise Ontologies, Business Modeling and Business Process Modeling. With the intention to provide overarching representation of contributions, we have conducted selection of 25 papers to represent extensions in use of these categories. The inclusion criteria was regarding the content of the works –

addressing information systems for operational, tactical, strategic, project management in at least two managerial functions (operational and tactical; tactical and strategic; …); containing information for tactical management information input, output, handling of mismatch; treatment of real-time or right-time information; inclusion of adaptability or predictability feature; addressing context capture and system or process design in the information system design. The works that had input for the before-mentioned criteria have been shortlisted and selected according belonging to the use of the four categories, described as initial foundation. Contributions that have been domain specific or business line specific have not been taken in consideration. Another, exclusion criteria was commercialized tools and solutions – the analysis is performed on theoretical artifacts only. Third exclusion criteria was for contributions that are addressing only one of the operational or strategic management, and every artifact in the shortlist addresses at least two of the managerial functions – inevitably including, or overseeing tactical management, which has been very useful to observe.

4. Analysis

The analysis of the selected literature according the questions stated in section 3.1 follows:

4.1 Primary orientation in terms of operational, tactical, strategic, project management and combinations of the contributions

The Information system support for tactical management, we argue, should be approaching the target audience according its characteristics - not generalization as any other type of management. As discussed in the introduction, the tactical management is facing high complexity and unpredictability. Since it is being the way to achieve the expectations of the company's existence, and since it is so much diverse and person- and company-dependent, it is addressed with the general principles of a certain level of management. From this standpoint, it was an interesting quest to see in what way which artifacts are assisting tactical management. Hence, the initial categorization is to be made by which level of management the analyzed papers are focusing on.
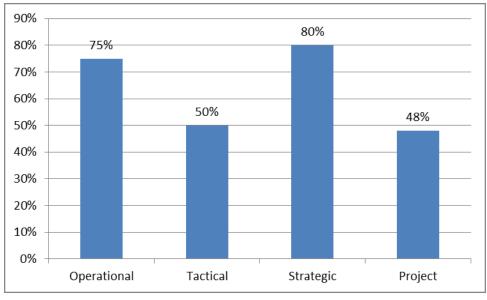

Figure 1: Coverage of the managerial functions (Operational, Tactical, Strategic, Project management) by the investigated works

Of course, one can argue that this is not complete and thorough literature review but more an "emerging issue that would benefit from exposure to potential theoretical foundations" (Webster and Watson 2002) and as such, conclusions about absence of focus to the characteristics of the tactical management and appropriate information systems can't be made. However, this investigation shows that there is significantly less coverage in some form addressing tactical management in general, present in only 50% of the papers, while Operational is in a hive of solutions with 75% preceded by Strategic with 80%. Project management has been addressed in 48% of the works (Figure 1).
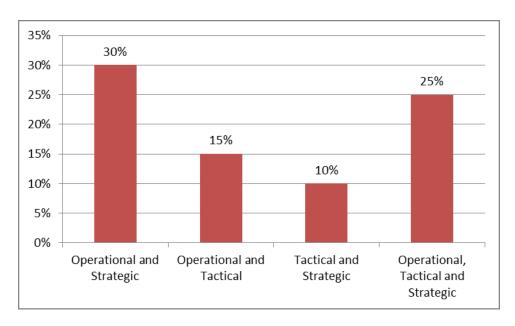
Figure 2: Combinations of focus of the information system solutions of the analyzed works in terms of operational, tactical, strategic and project management

Figure 2 shows the combinations that exist in the reviewed artifacts and approaches: interestingly, 30% of the investigated works tend to overarch Operations to Strategy (Iafrate 2013), (Buckley et al. 2005), (Werner 2013), (Kapoor et al. 2005), (Hoogervorst 2009), (Ba et al. 2008)(Berzisa et al., 2015); the one end of Operational and Tactical issues is being tackled by 15% of the works (IBM 2008), (Hoontae et al. 2007), (Hill 2009); and the other end of Tactical and Strategic by 10% of the works (Maes 2007), (Cherbakov et al. 2005)(Franceskoni et al., 2013) (Frank, 2014) and complete solutions for Operations, Tactics and Strategy are being given in 25% of the investigated works (Barone et al. 2010), (Gill 2013), (Berkem 2008), (Forno 2012), (Haeckel 2004) (Poels et al., 2013),(ISACA, 2012).

4.2 Information and processing input for tactical management, depending on the used tools, methods, approaches, artifacts

This aspect is browsed through the literature in order to perceive the provision of tactical management with information from the operations and/or wider entities and processes that are happening in the everyday work. This is one aspect that supports our idea that the tactical management is facing mismatch of incoming information vs outgoing information flows and outcome expectations. The idea behind is that tactical management proper information is much more than standard reports or automated dashboards because there are many operations, modifications and maneuvers that need to be done to any incoming data prior the tactical management information is appropriate for use. The solutions in literature are diverse. Starting from wide range of event driven and on-demand data with near-zero-latency Business Inteligence, predictive modeling, incorporating best practices and exceptions management (Iafrate 2013) Big analytics, massive data capture and business inteligence, "what-if" analysis, forecasts and trends (Buckley et al. 2005), support with processed data and integrated business intelligence (Werner 2013), as well as use of Business Event Processing, heterogeneous event types, internal and external multiple sources, event processing logic maintained by user – dashboards (IBM 2008) and personalized monitoring dashboards (Hoontae et al. 2007) that incorporate event-driven and on-demand information to be given at hand (Kapoor et al. 2005). Number of contributions are noted using enterprise architecture to facilitate context analysis (Hoogervorst 2009) (Gill 2013), 'Business Execution layer' feeding information (Simon et al. 2013). Enterprise modeling is being used in providing design of the sensing mechanism based on the Business Intelligence Model (BIM) and i* (Nalchigar 2013), in order to monitor the achievement of strategic goals, develop alternative responses, select the most suitable alternatives, implement and monitor the response (Barone et al. 2010). Frequent is the observation that the tactical choices that are available depend on the business model chosen by the firm in the first stage that depends on the strategy (Casadesus-Masanell 2009), while Ba et al. develop method aimed at effectively organizing, integrating, reusing knowledge and model components in direction of providing information and knowledge input for the alternatives, scenario models and model solutions of the decision maker (Ba et al. 2008). With Component Business Model (CBM) (Cherbakov et al. 2005) have seen information support through

the componentization and the dynamic processes, while the Business Motivation Model (BMM) and Service Oriented Architecture (SOA) are the basis for designing 'The Why (Business motivation), the What (Services) and the How (Service Description and Realization)' (Berkem 2008) to provide organized information supply. Business Process Execution Measurement Model (BPEMM), Business Activity Monitoring (BAM) and Process Mining (PM) are the basis for Overall Business Process execution measurement and Improvement approach that serves the levels of management with relevant BP information (Delgado et al. 2014). Modeling selected Business Processes, Describing functions, Roles, Alternatives, Actions is the approach used by (Frank, 2014) Noteworthy designs for information provision and automated decision-making are seen in the SIFT framework an abstract artifact (a framework comprising of models, measures and a method) for Information Quality improvement (Hill 2009), Integrative framework for Information Management (Maes 2007) where Strategy, Structure and Operations are differentiated and in the Adaptive Enterprise Service System Model (Gill 2013). Goals cascade and the Process-Practice-Activity concepts, especially the inputs and outputs of the Practices being useful for Tactical Management in the COBIT 5 framework (ISACA, 2013). Tactical view (for internal aspects of tactic) and Partnership view (for the partnerships among enterprises) are the way of addressing tactic in the TBIM (Franceskoni et al., 2013). Core concepts, Ecology concepts, Execution concepts, Evaluation concepts are the main elements which intertwine in the work of (Poels et al., 2013) To end with the other side of this spectrum, with the approaches of Forno and Haeckel, where proper positioning of information sensors with regard to the current accountability is recommended. (Haeckel 2004) (Forno 2012)

4.3 Output expected of tactical management ('ends')

With regard to the expected outputs or outcomes from the tactical management function, the literature analysis has resulted with the notion that most of the contributions expect the 'endings' to be Key Performance Indicators (KPIs), some of which using the Balanced Scorecard (BSC) as strategic framework, with the following modalities: KPIs (Ba et al. 2008) (IBM 2008) (Delgado 2014); Indicators and KPIs (Hoontae et el. 2007) (Berzisa et al., 2015); KPIs that align with strategic goals (Iafrate 2013); KPIs, Goals and Objectives (Buckley et al. 2005); KPIs and projections (Maes 2007); two loops for monitoring KPIs and ex-post periodic analysis (Werner 2013); KPIs through BSC perspectives (Kapoor et al. 2005) (Nalchigar et al. 2013) (Barone et al. 2010). 'Endings' in broader sense are defined and used as Mission, Goals (Hoogervorst 2009); Goals and Priorities (Gill 2013); Targets, Goals (Cherbakov et al. 2005); Strategic guidelines reflected in the selected business model (Casadesus-Masanell et al. 2009); Business motivation, Business Model (Simon et al. 2013); and Metrics (Hill 2009). Business goals as part of the ends drive courses of actions (strategy and tactic), directives (rules and policies) till business processes in the (Berkem 2008) paper. Strategic goals are used in the work of (Franceskoni et al., 2013) (Frank, 2014) The RACI charts roles that address tactical manager's role expectations as well as the integrated goal cascades are used in COBIT 5 (ISACA, 2013). Evaluation concepts (quality, productivity, legal compliance, sustainable innovation) serve as KPIs in the work of (Poels et al., 2013). To complete the horizon with the Reason for being (Purpose) and the Outcomes accountable for, that are used as 'endings' defined and used by (Forno 2012) and (Haeckel 2004) while achieving whatever indicators a company needs.

4.4 Handling mismatch of information

According the previous two concepts, our standpoint that the tactical management position in the middle of Strategy and Operations, Clients and Company and Management and Employees faces mismatch of incoming and outgoing information that needs to be handled in some way. Usually, the additional operations of data exported from the existing systems are performed by the manager him/herself (research in progress); but there is significant variance in time, quality, personal approach and effects when that operation is performed individually. The theoretical approaches offer different solutions for this problem: starting from Automatized conversions and reasoning of data (Iafrate 2013) and automated decision making (Hill 2009); Sense and Respond Business Performance Management that orchestrates dynamic, structured and unstructured information within a continuous, adaptive event-based planning process, also determines business rules and policies and orchestrates among the value partners to achieve better overall performance (Buckley et al. 2005) through management by exception, most of the data is automatically converted with some prescribed reasoning and processing logic (IBM 2008). Business Process design and KPI definition (Werner 2013) and essential alignment of measures that are related to business strategy and goals for the entire organization with the ones that are specific for each business process (Delgado et al. 2014) are another type of approaches trying to address the mismatch of information on tactical level. Modeled conversions and reasoning of data are visible in the papers of (Kapoor et al. 2005), (Nalchigar et al. 2013), (Ba et al. 2008), (Hoontae et al. 2007),

all the way to more specific, short-term, semi-structured modeling possible for Mid-level management control (Barone et al. 2010). "Means (Strategy, Tactics) and Ends (Vision, Goal, Objective) to cover the "total disconnection" of the business processes with the business goals and rules" (Berkem 2008). Comparison of the model (requires vs. produces) is intended to handle the in-out mismatch of information (Frank, 2014). Noteworthy for our suggestion for tactics is the design of "establishing capability delivery patterns and context indicators that monitor whether the design for capability delivery is still valid for the current context situation" (Berzisa et al., 2015) Heads Up displays for every role (Haeckel 2004) and no ambiguity in the defined Purpose and Governing principles together with proper communication and sensors while negotiating towards the outcome (Forno 2012) are the approach that can be adapted to any level of management, including tactical.

4.5 Right-time information or real-time information

Our idea for tactical management underlines the necessity of right-time information, which has some low latency in terms of time and frequency and almost no latency in terms of structure and scope. However, theoretical contributions discuss and strive for real-time information (Iafrate 2013), (Buckley et al. 2005), (Werner 2013), (Kapoor et al. 2005), (Ba et al. 2008), (IBM 2008), (Hoontae et al. 2007), (Cherbakov et al. 2005), (Delgado et al. 2014), (Barone et al. 2010); or in terms of shortening the latencies (Nalchigar et al. 2013), (Forno 2012), (Haeckel 2004). Some of the papers are not addressing this issue at all, not being focus of their approach.

4.6 Sense-and-respond framework and adaptability loop

We perceive the Sense-and-Respond managerial concept as introduced by Haeckel in 1999 as good starting point for attempting to solve the adaptability, ambiguity, uncertainty and complexity the tactical management is facing with (Petrevska Nechkoska et al., 2014). Its component, the SIDA Loop is the revising mechanism that provides the adaptability to changing environment, circumstances, stakeholder needs and accountabilities. From this standpoint, we submit the reviewed contributions also to these concepts to perceive whether they have been used or not, and with which understanding and implementation. No explicit use of these concepts has been noted in the papers of (Hoogervorst 2009), (Ba et al. 2008), (Hoontae et al. 2007), (Hill 2009), (Berkem 2008), (Maes 2007), (Simon et al. 2013), (Delgado et al. 2014), (Casadesus-Masanel et al. 2009). However, according our perception, the SIDA loop has been implicitly integrated in the BPCIP (Delgado et al. 2014); in the Plan-Do-See-Act design (Hoontae et al. 2007); and addressed through the Input of the Knowledge Provider, the Processing of the Knowledge Broker and the Output of the Decision Makers (Ba et al. 2008) and Scan&Sense, Interpret&Analyze, Decide&Respond (Gill, 2013). In own interpretation, both terms have been used by (Barone et al. 2010) and separately with BIM to sense and interpret and with their artifact to decide and act (Nalchigar et al. 2013). The TBIM (Franceskoni et al., 2013) uses the automated reasoning techniques, including 'what if' and 'is it possible'; SWOT analysis - all included in the BIM as baseline framework. In the work of (Frank, 2014) the MEMO steps (Multiperspective Enterprise Modeling) are prescribed to provide adaptability of the system and processes. IBM's definition and approach to these concepts is visible in the work of (IBM 2008), (Cherbakov et al. 2005), (Buckley et al. 2005), (Werner 2013) and in a way that the S&R system uses available data, such as forecasts, customer orders, and supply commitments, and aims to provide an early warning system for conditioning with an important innovation - a new algorithm that identifies potential problems by using historical information and future indicators to forecast trends for customer orders and to compare trends and forecast as lead indicators of future occurrences (Kapoor et al. 2005). The core definition, Knowing earlier, Managing by wire, Dispatching capabilities from the event back, Designing a business as a system (Haeckel 2004) as Sense-and-Respond basics are explicitly used by (Forno 2012).

4.7 Adaptability

The concept of Adaptability is analyzed in conjunction with modularity, and the deduction is as follows: when the discussion of the authors is in terms of business processes, the adaptability is perceived in their adjustment (Iafrate 2013), predefinition (Werner 2013), corporate agility (IBM 2008), Monitoring Modeling, Event Modeling, Indicator Modeling, Alert and Response Modeling (Hoontae et al. 2007), Business Processes and stable and loosely coupled services (Berkem 2008) all the way to setting up continuous improvement cycle for business processes implemented by services in organizations based on BP execution measurements (Delgado et al. 2014). Enterprise design and architecture create the ability to adapt and change for the future and systems thinking is significantly present in the adaptability aspect of the work of (Hoogervorst 2009). Enterprise-wide business processes and setting the context, designing for change, executing the SIDA loop -

process for re-engineering the enterprise are significant for Kapoor et al. 2005, while composite services and dynamic processes based on componentization, partner networks; value nets, service oriented enterprise are discussed by (Cherbakov et al. 2005). (Maes 2007) sees the modularity and the adaptability prescribed in the structure of the company, while their determination by the selected business model is present in the work of (Casadesus-Masanel 2009), (Barone et al. 2010) (Simon et al. 2013), (Ba et al. 2008), culminating with continued focus on responsiveness and adaptability provided by a a model-driven capability design and an architectural framework of loosely coupled components for adaptive business management (Buckley et al. 2005). Adaptive Enterprise Service System Model and underlying adaptive enterprise architecture into adaptive enterprise architecture capability for handling complex enterprise transformations based on the view of the enterprise as a system with subsystems are largely discussed by (Gill 2013). Adaptability is not explicitly set up but is recommended in the accountabilities in COBIT 5 (ISACA, 2013). Alternative plans are the prescribed way of addressing adaptability in the work of (Franceskoni et al., 2013) and (Frank, 2014). The SIDA loop as generator of adaptability, the constant negotiations and the system design of the enterprise existence with flexible role occurrences are used in their generic sense by (Haeckel 2004) and (Forno 2012).

4.8 Predictability

For indirect support of our choice of the Sense-and-Respond concept is the investigation how do all these different authors perceive predictability or unpredictability of the environment into account for their contributions, we performed the scan of the approaches through the lens of this concept. If we set aside the works where this issue hasn't been addressed or not being focused on, there are two general standpoints: attempts to provide forecasting, what-if alternative analysis, extrapolation, optimization and predicting ability to the management, by different tools, algorithms and business intelligence activities (IBM 2008), (Hoontae et al. 2007), (Hill 2009), (Delgado et al. 2014), (Barone et al. 2010) (ISACA, 2013), through the variation of identifying runtime variations (Werner 2013) and maintaining lowest latencies possible (Nalchigar et al. 2013) all the way to assuming unpredictability and uncertainty (Hoogervorst 2009), (Gill 2013), (Forno 2012), (Haeckel 2004), (Cherbakov et al. 2005). Patterns that reflect best practices and their run-time or execution-time adaptation are the specific instrument used in the work of (Berzisa et al., 2015)

4.9 Context capture

Capturing the context is of primary importance for any managerial function. It becomes strikingly observable for tactical management – both in terms of organizational context (changes in purpose, goals, governance, priorities, structure, resources …) and in terms of the environment (immediate events that influence the work, early signals from important entities or events, …) "The temporal dimension has been found to play a central role in the understanding of the explanatory factors of IS success and failure in an organizational context (Alter 2013; Pettigrew et al. 2001)" (Dwivedi et al., 2015).The authors Berzisa et al. (2015) and Zdravkovic (2013) define in a plastic way as 'design-time' ("by eliciting business goals, Key Performance Indicators (KPI), designing generic business processes and resources, as well as by specifying capabilities, relevant context sets and patterns") and 'run-time' (when the IS ability "to handle changes in different context is put to test"). This concept has been addressed in abundant diversity. We have grouped the findings in regards to contextual scanning in three main directions, and we will present the different original approaches within, by the various contributions:

- Approach 1: Real-time context scanning
  - Real-time monitoring (Buckley et al., 2005) (Cherbakov et al., 2005) (Maes, 2007)
  - Business Activity Monitoring (IBM, 2008)
  - Dashboard with user-defined rules for alerts; Management by Exception (Hoontae et al., 2007)
  - Context-Mechanism-Outcome Configuration (Hill, 2009)
  - Zero-latency contextual scanning (Iafrate, 2013)
  - Set the context, Design for change, Execute the SIDA loop - process for re-engineering the enterprise (Kapoor et al., 2005)
  - Continuous Business Process Improvement; real-time monitoring on business process execution and BP improvement (Delgado et al., 2014)
- Approach 2: Contextual scanning and reaction according needs – potential for 'right-time' information

- ▪ Sense-and-Respond and/or SIDA loop use for context capture (Buckley et al., 2005) (Kapoor et al., 2005) (Nalchigar et al., 2013) (Forno, 2013) (Haeckel, 2004)

- ▪ Scan&Sense, Interpret&Analyze, Decide&Respond (Gill, 2013)

- ▪ Feedback and the Monitoring process (ISACA, 2013)

- ▪ Context indicators monitor whether the design for capability delivery is still valid for the current context situation (Berzisa et al., 2015)

- ▪ Ecology concepts aggregates the service system entities that are involved in the service system and Evaluation concepts(quality, productivity, legal compliance, sustainable innovation) that serve as KPIs that are monitored for realization (Poels et al., 2013)

- ▪ Approach 3: Ex-post periodic analysis and comparisons

  - ▪ Two loops, monitoring KPIs, ex-post periodic analysis (Rausch et al., 2013)

  - ▪ Discrete, What-if and SWOT analysis (Barone et al., 2010) (Berkem, 2008) (Franceskoni et al., 2013)

  - ▪ Enterprise Architecture facilitating context analysis, Learning rather than planning (Hoogervorst, 2009)

  - ▪ Comparison of the model (requires vs. produces) (Frank, 2014)

Our interest in tactical management defines our standpoint that when performing this function, the manager should continuously scan the context both for changes organization-wise (in the goals, governing principles, priorities, …) that happen occasionally, but also for daily organizational changes (staff, resources, incidents, cascading changes in plans, …) and environmental changes (competitors, other stakeholders, clients, other departments, …) Adaptation of the work to all these changes, while still pursuing the given goal, is necessary, especially for the tactical management. From the three approaches observed in literature, we would be in favor of right-time contextual scanning – in order to relief the burden of unnecessary real-time information enterprise systems investments and still provide proper alert for the manager.

4.10 System design, Process design focus or combination of approaches

From a managerial point of view, the need for system view, if not even system design, is highest for strategic management and tactical management (including project management), and the accent on process design is needed for operational management. Of course, strategic management pays attention to efficiency and processes, at the same time; while, in our perception, the tactical management puts effectiveness before efficiency – and system design prior process design. There are contributions that address Operational and Tactical Management but persist in the process design usage - 12%, Operational and Strategic Management and still retain the process design – 16% and 4% of approaches that treat Tactical and Strategic Management with Process Design only (Table 1). The rest of the contributions, use either system design or both system and process design because they are addressing the whole company or Tactical and Strategic Management.

Table 1: Overview of Process, System or combined approach usage in the investigated works

	Operational, Tactical	Operational, Strategic	Tactical, Strategic	Operational, Tactical, Strategic
Process design	12%	16%	4%	
System design			12%	8%
System and Process design		20%	12%	16%

5. Interpretation of the results and conclusions

The tactical management specificity should be stressed to a great extent when designing information systems for the companies. This research reaches several important findings in the direction of under-addressing with specific approach by the Information System contributions; ingestion or assimilation of the tactical by the operational or strategic management; attempts to automatize the handling of mismatch of incoming and outgoing information; to some extent unnecessary strive for real-time information environments; divided tendencies towards providing adaptability or predictability to the management; diverse ideas for context capturing and treatments of tactical management as process or system.

The feeding with information to the tactical management is done mostly on a technical level of implementation, and usually with structured, automatized data and automatic connections and dashboards. The present tendency of closing with endings by shooting real-time operational data towards strategic dashboards that are performing some sort of KPI monitoring on different levels of management is visible in 30% of the papers (Figure 2), which, according to our standpoint, is too big of a distance, and too present of mismatch for feasible implementation in the real business world. Hence, the current support for handling the mismatch of information in the middle is done with automatized logic, that can't always be prescribed, with modeling and incorporation in business processes, but maybe with not exploited enough governing principles and purpose that individualize the conversion logic and bring it down to context and structure.

The top-down approaches starting from strategic level, cascading outcomes, quantitative but also qualitative expectations, are somewhat assimilating tactical management specifics. There is significant 'ingestion' of the tactics by operations or strategy, in the last period of time.

In terms of adaptability, still, the solutions base on the somewhat rigidity of business processes, or their continuous improvement, while tactical management needs flexible support in flexible/unstructured/dynamic processes. Unpredictability is still little concern to the contemporary solutions, which for the whole companies and especially for tactical management should not be assumed. The context capture is of interest in all the contributions, noting diverse ideas and approaches on how to address it. With regards to tactical management the context capture is an ongoing process of revising the current setup – sensing, interpreting what it means to the functionality of the socio-technical system and its outcomes, deciding what should be changed, which is the trigger to being informed and mapping the information system needs for this function, and acting. Last, but not least, we would like to contribute with the finding that the tactical manager needs system thinking and system design in order to facilitate the socio-technical system towards an outcome and effect, while the efficiency should be a second criterion when reasoning and acting.

Hopefully, this research will turn the lights towards tactical management, as present and making a difference in every pore of life, especially in business, with its specifics and elasticity, rather then general managerial treatment; which should be addressed with appropriate identification of characteristics and followed up by innovative information systems concepts and solutions.

References

Ba S., Lang K. R., Whinston A. B., (2008) "Compositional Enterprise Modeling and Decision Support", *Handbook on Decision Support Systems 2*, Springer Berlin Heidelberg

Barone D., Mylopoulos J., Jiang L., Amyot D., (2010) *The Business Intelligence Model: Strategic Modelling*, University of Toronto, Canada

Berkem B., (2008) "From The Business Motivation Model (BMM) To Service Oriented Architecture (SOA)", *Journal of Object Technology Vol. 7 No. 8*, ETH Zurich

Berzisa S., Bravos G., Gonzales T. C., Czubayko U., Espana S., Grabis J., Henkel M., Jokste L., Kampars J., Koc H., Kuhr J-C., Llorca C., Loucopoulos P., Pascual R. J., Pastor O., Sandkuhl O., Sandkuhl K., Simic H., Valverde F. G., Zdravkovic J. (2015) "Capability Driven Development: An Approach to Designing Digital Enterprises", Springer Fachmedien Wiesbaden

Buchanan R. D., Soley R. M., (2002), *Aligning Enterprise Architecture and IT Investments with Corporate Goals Whitepaper*, Object Management Group

Casadesus-Masanell R., Ricart J. E., (2009) *From Strategy to Business Models and to Tactics*, IESE Business School – University of Navara

Cherbakov L., Galambos G., Harishankar R., Kalayana S., Rackham G., (2005) Impact of the service orientation at the business level, *IBM Systems Journal* Vol. 44, No. 4

Delgado A., Weber B., Ruiz F., Guzman I. G.-R., Piattini M., (2014) "An integrated approach based on execution measures for the continuous improvement of business processes realized by services", *Information and Software Technology*, Elsevier B. V.

Dwivedi Y. K., Wastell D., Laumer S., Henriksen H. Z., Myers M. D., Bunker D., Elbanna A., Ravishankar M. N., Srivastava S. C. (2015) "Research on Information Systems Failures and Successes: Status update and future directions", Information Systems Frontiers, vol. 17, Springer, p: 143-157

Edvinsson, L., Malone, M. S. (1997) "Intellectual Capital: The Proven Way to Establish Your Company's Real Value By Measuring Its Hidden Values", Piatkus. London.

Elkington, J. (1997) "Cannibals with Forks: the Triple Bottom Line of 21st Century Business", Capstone Publishing Ltd. Oxford.

Forno D. J., (2012) *Applying Sense&Respond to Create Adaptive Organizations*, Available: http://www.senseandrespond.com/downloads/AdaptiveEnterpriseExperience--Forno.pdf. Last accessed on 1 April 2014

Franceskoni F., Dalpiaz F., Mylopoulos J. (2013), "TBIM: A language for Modeling and Reasoning about Business Plans" Technical Report #DISI-13-020, Department for Information Engineering and Computer Science, University of Trento, Italy,

Frank U. (2012) "Multi-perspective enterprise modeling: foundational concepts, prospects and future research challenges", Software Systems Models, Springer-Verlag

Gill A. Q., (2013) "Towards the Development of an Adaptive Enterprise Service System Model", *Adaptive Enterprise Architecture Toolkit*, Proceedings of the Nineteenth Americas Conference on Information Systems, Chicago, Illinois

Haeckel S. H., (2004) "Peripheral Vision: Sensing and Acting on Weak Signals Making Meaning out of Apparent Noise: The Need for a New Managerial Framework", *Long Range Planning*, Elsevier

Haeckel S. H., (1999) *Adaptive Enterprise: Creating and Leading Sense-And-Respond Organizations*, Harvard Business School Press Boston

Hill G., (2009) *A Framework for valuing the quality of Customer Information*, PhD Thesis, The University of Melbourne

Hiekkanen K., Helenius M., Korhonen J. J., Patricio E, (2013) "Aligning Alignment with Strategic Context: A Literature Review", *Digital Enterprise Design and Management*, Springer-Verlag Berlin Heidelberg

Holland, J. H. (1996). Hidden order. How adaptation creates complexity. Reading, MA: Addison Wesley, p: 10.

Hoogervorst J., (2009) *Enterprise Governance and Enterprise Engineering*, Springer London

Hoontae K., Yong-Han L., Hongsoon Y., Nam Wook C., (2007) "Design and Implementation of a Personalized Business Activity Monitoring System", *Human-Computer Interaction*; Springer-Verlag Berlin Heidelberg

Iafrate F., (2013) "Use Case: Business Intelligence "New Generation" for a "Zero Latency" Organization (When Decisional and Operational BI are Fully Embedded)", *Digital Enterprise Design and Management*, Springer Berlin Heidelberg

IBM, (2008) "Empowering the business to sense and respond: Delivering Business Event Processing with IBM WebSphere Business Events, Business Event Processing", *WebSphere software White Paper*, IBM New York

International Organization for Standardization 2015. http://www.iso.com (5 May 2015).

ISACA (2012) "Cobit 5 – A business framework for the governance and management of enterprise IT",

Janssen M., van der Voort H., van Veenstra A. F., (2015) "Failure of large transformational projects from the viewpoint of complex adaptive systems: Management principles for dealing with project dynamics", Springer Science+Business Media New York

Kaplan, R. S., Norton D. P., 2007. Using the Balanced Scorecard as a Strategic Management System, Harvard Business Review.

Kapoor S., Bhattacharya K., Buckley S., Chowdhary P., Ettl M., Katircioglu K., Mauch E., Phillips L., (2005) "A technical framework for sense-and-respond business management", *IBM Systems Journal*, Vol 44, No 1

Loucopoulos P., Lyytinen K., Liu K., Gilb T., Maciaszek L.A.: (2006) "Project Failures: Continuing Challenges for Sustainable Information Systems", *Enterprise Information Systems VI*, Seruca I., Cordeiro J., Hammoudi S., Filipe J. (Ed.), Springer (p: 1-8)

Lyytinen K., Bergman M., King J. L.: (2006) "Large Scale Requirements Analysis as Heterogeneus Engineering", *Enterprise Information Systems VI*, Seruca I., Cordeiro J., Hammoudi S., Filipe J. (Ed.), Springer (p: 9-22)

Maes R., (2007) "An Integrative Perspective on Information Management", *PrimaVera Working Paper Series*, University of Amsterdam

McNair, C.J., Watts, T. (2009) "The integration of balanced scorecard models", Cost Management

Meyer B., (2014) "Agile! The Good, the Hype and the Ugly", Springer International Publishing Switzerland

Nalchigar S., Yu E., (2013) "From Business Intelligence Insights to Actions: A Methodology for Closing the Sense-and-Respond Loop in the Adaptive Enterprise", *The Practice of Enterprise Modeling*, Springer Berlin Heidelberg

Neely A. D., Adams C., Kennerley M. (2002) "The Performance Prism: The Scorecard for Measuring and Managing Business Success", Financial Times Prentice Hall. London.

Petrevska Nechkoska, R., Manceski, G., Poels, G., (2014): "Meeting Point of Strategy and Operations: Tactical Management Sense-and-Respond Framework Enhancement," Proceedings of the 8th ECIME 2014, AC&PI Ltd., UK.

Poels G., Van Der Vurst G., Lemey E. (2013) "Towards an Ontology and Modeling Approach for Service Science" in IESS 2013, LNBIP 143, e Cuhna J.F., Snene M., Novoa H. (Eds), Springer-Verlag Berlin-Heidelberg, pp. 285-291

Rausch P., Sheta A. F., Ayesh A., (2013) "Business Activity Monitoring", *Business Intelligence and Performance Management, Theory, Systems and Industrial Applications*, Springer-Verlag London

Schwalbe K. (2014) "Information Technology Project Management", Course Technology, Boston, USA, pp. 7

Simon D., Fischenbach K., Schoder D., (2013) "Enterprise architecture management and its role in corporate strategic management", *Information Systems E-Business Management*, Springer-Verlag Berlin Heidelberg

Sveiby K. (1997) "The Intangible Assets Monitor", Journal of Human Resource Costing and Accounting, Emerald Insight

"tactics." Merriam-Webster.com. 2014. http://www.merriam-webster.com (2 January 2014).

Tennant G., (2001) "Six Sigma: SPC and TQM in manufacturing", Gower Publishing Limited England

Van Grembergen W., Saull R., De Haes S. (2015) "Linking the IT Balanced Scorecard to the Business Objectives at a Major Canadian Financial Group", University of Antwerpen Management School, ITAG Research Institute, http://www.antwerpmanagementschool.be/media/287506/linking%20it%20scorecard%20to%20bus%20objectives%20can.pdf (accessed on 5 May 2015)

Webster J. and Watson R. T., (2002) *"Analyzing the Past to Prepare for the Future: Writing a Literature Review"*, MIS Quarterly, Vol. 26, No. 2

Werner S., (2005) "Sense and Respond Business Performance Management", *Supply Chain Management on Demand: Strategies, Technologies, Applications*, Springer Berlin HeidelberWelsh K., Sawyer P., Bencomo N. (2011)"Towards Requirements aware Systems: Run-time Resolution of Design-time Assumptions", IEEE Explore, USA

Zdravkovic, J., Stirna, J., Henkel, M., Grabis, J. (2013) "Modeling Business Capabilities and Context Dependent Delivery by Cloud Services", CAISE 2013, LNCS 7908, Springer-Verlag Berlin Heidelberg