Developing SOA-enabled service agility capabilities: case studies in services industry

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Abstract: The research paper explores how information technology, specifically service-oriented architecture (SOA)-enabled service agility capabilities, were developed. The paper defines the service agility capabilities (sensing and responding) using dynamic capabilities theory and service dominant logic. In this research, we present two case studies, based on the services sector. This paper explains, ‘how’ these capabilities were developed by responding organisations. Based on the research results, the propositions were proposed. Further, the model was supported through thematic analysis. The study contributes towards the knowledge base of agility and reveals how SOA-enabled capabilities are developed to achieve agile services.

Keywords: service agility; capabilities; service-oriented architecture; SOA; environmental turbulence; dynamic capabilities theory.


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1 Introduction

Organisations today are working in a turbulent environment facing continuous change because of hyper-competition, changing demands of customers, regulatory changes and technological advancement (Overby et al., 2006). They need to develop capabilities to sense and respond to these changes. These capabilities have been identified as agility capabilities in literature. It is not surprising that almost 90% of executives surveyed by the Economist Intelligence Unit in 2009 believed that organisational agility is critical for business success (Glenn and Stahl, 2009). However, the study by Accenture points out, that the concept of agility, specifically, the implementation, has proved elusive for many businesses in many industries (Shill et al., 2012). Evidently, the concept of firm agility has grabbed the attention of both practitioners and researchers.

Sharifi and Zhang (1999, p.9) define agility as the “ability to take advantage of change, cope with unprecedented challenges and survive unprecedented threats of business environment”. Agility has also been defined as “ability to detect opportunities for innovation and seize those competitive market opportunities by assembling requisite assets, knowledge and relationships with speed and surprise” [Sambamurthy et al., (2003), p.238]. Over the years, researchers have studied enterprise agility, supply chain agility and customer agility. This implies that agility when studied at the firm level (to understand whether a firm is agile or not) is being studied at the context level like supply chain agility, customer agility, etc. This became necessary because in their endeavour to
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become agile, firms should know what capabilities need to be developed at the functional level and further, how these capabilities can be developed.

A hypercompetitive turbulent environment is driving organisations to compete by capturing more short-term opportunities through many competitive actions, rather than planning for long-term competitiveness (Sambamurthy et al., 2003). Further, they are capturing idiosyncratic needs of the customers and design and deliver services to single segment customers. This helps them to improve their competitive position by differentiation. Further, today’s customers have more choice than ever and those choices are increasingly important as well as difficult to identify (Dabholkar, 2015). Only those firms, which can identify what the customer wants and are responsive to their dynamic demands, can gain competitive advantage [Weill et al., (2002), p.57]. Thus, by developing agility capabilities, firms will be able to deliver agile services to meet the ever-changing needs of customers faster than competitors.

Though the agility literature discusses the, agility capabilities but there is dearth of literature on agility capabilities, specifically to meet the ever changing and single customer segment needs. If the firms want to be agile for single customer needs, they need to be specific and should focus on new agility capability in the form of service agility capability. A basic tenet is that firms must continually adapt their capabilities in order to remain competitive. And therefore, based on the dynamic capabilities literature, capabilities are defined as the firms’ ability to integrate, build, and reconfigure internal and external competencies to address rapidly changing environment (Teece et al., 1997). Thus agility is one form of dynamic capability; dynamic capability being a much broader concept.

A motivated literature survey was carried out to unravel service agility capabilities in existing research and a clear research gap was obtained. This further motivated this research work to not only identify the constituents of service agility capability, but to explore how the organisation is developing the same. However, the first task was to define service agility capability. Thus in this paper, the service agility capability is defined as ability to sense and seize service-based opportunities by detecting unanticipated changes in turbulent environments and responding by assembling requisite knowledge and systems aligned to deliver services quickly. This definition is further explained through identifying the constituents of service sensing capabilities and service responding capabilities to deliver aligned services, i.e., sensing and responding as two sequential processes. Thus service agility sensing capabilities focuses on service opportunities resulting from change. Such opportunities have to be quickly responded to, by developing aligned capabilities faster than the competitors and surprising the stakeholders. Technology acts as an enabler to deliver such services.

In agility literature the role of IT has been identified as enabler of firm’s agility (Sambamurthy et al., 2003; Tallon and Pinsonneault, 2011). Some studies also mention IT as a disabler of agility (van Oosterhout et al., 2006). Monolithic software such as Enterprise System software has inherent characteristics which hinder the changes to take place. And hence, such software when implemented in organisations may hinder agility. The rapid advancement of technological environment is responding to the changing needs of the industry. Novel Technologies such as service-oriented architecture (SOA), and cloud computing are projected as enablers of agility. Becker et al. (2009) identified agility as most frequently mentioned value potential of SOA. Lal and Bharadwaj (2015) identified cloud computing as an enabler of flexibility. Despite this, most existing studies
are limited to the theoretical claims of impact of SOA on agility, which still need to be validated. The relationship with SOA and organisational agility are not entirely understood and the relationship between SOA and service agility has not addressed in the studied literature. SOA epitomises a core technology in the increasingly important discipline of service science. SOA consists of a composite set of business aligned services that support flexible and dynamically reconfigurable end-to-end business services (Agarwal et al., 2011). Implicit in this definition is the objective of application of SOA to enhance service agility. It has been perceived that the newer opportunities in the telecom services use advanced service computing technologies. They provide access to single segment services, according to specific customer needs. SOA is one such technology which can cater to such services (Ritcher and Basten, 2013).

The objective of this research is to explore how SOA-enabled service agility capabilities are developed in the service sector. Sections 2 and 3 discuss the theoretical foundation and the conceptual model. Section 4 discusses the research methodology. Section 5 explains how the case study organisations have developed service agility capabilities enabled by SOA and further how they defining and developing agile services. The case study results are presented in Section 6, followed by the discussion, theoretical and practical implications section. Finally, conclusions are presented.

2 Theoretical foundations

Teece and Pisano (1994) mentioned that firms, which have developed dynamic capabilities, are able to generate, scan, adopt and apply existing and new knowledge, which can result into effective output. Further, these firms have designed systems and processes, which can dynamically be configured to meet the changes in the environment. Agility as dynamic capability, is viewed as set of organisational routines and processes (dynamic in nature and not static), that produces a particular output. Sharifi and Zhang (1999) define agility capabilities as abilities that provide the required strength for responding to changes. Agility capabilities are complex, structured and multi-dimensional (Winter, 2000), and they help in sustaining organisational performance (Teece, 2009). Agility capabilities’ have also been defined as the essential capabilities, the company needs in order to positively respond to and take advantage of the changes (Dani and Ranganathan, 2008). Agility capabilities improve competitiveness and profitability of an organisation (Charles et al., 2010). The focus of this research paper is to examine, how service agility sensing, responding and SOA-enabled service agility capabilities are developed.

Though dynamic capability helps in defining service agility capabilities, it is service-dominant logic, which explains the sequence of service sensing and responding capabilities. Service-dominant logic (Vargo and Lusch, 2004) focuses on value co-creation and on the process of capability building, which starts and ends with the customers. In service-dominant logic, knowledge or insight is the source of competitive advantage and capturing that ‘knowledge’ is the capability of an organisation. Further, as per service-dominant logic, value is created through network of partners, which explains the service integration capabilities. Some of the capabilities which are consequential from S-D Logic are networking, integration and ability to deliver services as a competitive offering. Thus the literature identifies agility capabilities, which have been extended to service agility capabilities by referring to S-D logic.
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2.1 Agility as a performance outcome

Yauch (2011) conceptualise agility as performance outcome stating that most successful organisation, are those which operate in highly turbulent business environment. Further, the study entailed the development of simple two dimensional (2 × 2) matrix based on environmental turbulence and organisational success. This further portrayed high agility in case of high turbulence and high organisational success. However, the performance outcome has not been measured through nature of products of services or rate of introduction of products and services in the market. In this research, agile services have been defined as performance outcome of agile service organisations and is further developed using S-D logic.

Service-dominant logic defines services as an outcome of value co-creation. Also S-D logic mentions that, value is always unique, i.e., idiosyncratic, experiential, contextual and meaning-laden and phenomenological. It is determined by the beneficiary. This helped us in developing the construct of agile services. In this paper, we have defined ‘agile services’ as a performance outcome in services sector. We define agile services as those services which address variations in service delivery requirements due to changes in turbulent environment, through dynamic combination of service offerings, pricing, and delivery. The next section deliberates the development of conceptual model.

3 Conceptual model

3.1 Agile services

Service is defined as any direct provision or co-creation of value between a provider and a customer. Zhang and Chen (2008) argued that co-creation with customers is a systemic process in which resources are integrated and operated on, in a service system. A service system as discussed in service science literature is essentially a social-technical system for delivering services using all available means to realise value for both provider and consumer (Qiu, 2009). A service system combines ‘resource-based definition’ as well as ‘process-based definition of co-produced values (services)’. In the resource-based definition, services are treated as an application of competencies, making use of knowledge, skills and experiences of all stakeholders (employees, partners and customers in co-production). The process-based view discusses how these services are produced for the ultimate consumer. Thus, agile service firms are those which deliver agile services through agile operations, agile partnerships and agile organisation structures.

Agile services are those services, which are delivered proactively by responding to unanticipated service needs, including the idiosyncratic needs of the customers. Such services address variations in service delivery requirements. This could be due to changes in turbulent environment, through dynamic combination of service mix (price, promotion, and service offering) manifested through resources and processes. The portfolio of agile services is enhanced by dynamically addressing three different components of service mix. These services are dynamic, context specific, aggressively change embracing and growth oriented (Goldman, 1995). When an organisation is able to change and enhance its portfolio of services in turbulent environment, faster than its competitors, we would consider such an organisation as being able to deliver more agile service as compared to its competitors.
3.2 Environmental turbulence

Initial research on environmental turbulence studied how environment influenced the organisation. Unexpected market changes can compel the firms to change their business strategy. The scale and scope of market threats and opportunities shows that there is more downside risk to firm competitiveness from failing to respond in time. There is greater chance that firm’s competitiveness will improve if firms can react faster than their rival (Lawrence and Lorsch, 1967; Miles et al., 1978). Ottensen and Gronhaug (2003) have further interpreted environment turbulence in terms of changes in economic climate, technological landscape, and regulatory changes, which result in increase in competitive intensities. Thus in turbulent environment, the firms need to demonstrate higher degree of agility.

3.3 Service agility sensing and seizing capabilities

The concept of sensing capability has been grounded in the strategic management studies and is closely related to the concepts of market orientation and the absorptive capacity (ability to acquire, assimilate, transform and apply knowledge) (Cohen and Levinthal, 1990; Kohli et al., 1993; Overby et al., 2006). Sensing refers to gathering of relevant market intelligence. There is a need to scan the business environment and capture business insights. This is facilitated by processes, technologies, values and norms about the future situations (Sambamurthy et al., 2003). We have identified three activities for service agility sensing for an organisation, which forms part of service system that needs to be agile. We consider customer and market insight, external environmental insight and internal environment insight as the components of sensing capabilities.

3.3.1 Market and customer insight

The concept of market insight emanates from market orientation. Kohli and Jaworski (1990) mentioned that market orientation composed of three sets of activities:

1. organisation-wide generation of market intelligence pertaining to current and future customer needs
2. dissemination of the intelligence across departments
3. organisation-wide responsiveness to it.

The customer insight concept includes two things; first is ‘knowing about’ the customers and secondly ‘knowing from’ the customers. The customer segmentation based on customer’s transactional and behavioural data and their demographic information is valuable in today’s competitive business environment.

P1 Agile services can be successfully delivered if SOA-enabled customer and market insight capabilities are deployed.

3.3.2 External environmental insight

Environment poses important constraints and contingencies for a firm’s competitiveness. The survival of organisations can depend on the ability to monitor and adapt to environmental changes. Also, environment changes impact the performance of firms.
Sensing changes in an external environmental capability is developed through scanning strategic information about environmental variables. Scanning can be particularly important for monitoring broad trends and identifying new market opportunities (Bourgeois, 1980). Scanning also provides basic data and information, which allows executives to interpret their environment (Boyd and Fulk, 1996). There are many regulatory changes that have impact on organisations. The regulatory changes are the outcome of political changes on the national and international level (Yauch, 2011). Thus, the initiatives should be taken in a manner such that there is no threat to the present competitive position of the organisation, and the regulatory and market norms are well understood. Service agility sensing capability refers to ability to sense changes in the market with respect to political, economic, technological environmental and legal changes specific to the organisation.

P2 Agile services can be successfully delivered if SOA-enabled external environment insight capabilities are deployed.

3.3.3 Internal environment insight

Absorptive capacity literature refers to transformative processes for retaining knowledge over time, to avoid losing ideas, changes and opportunities that are sensed. This seized knowledge refers to opportunities, as well as knowledge related to processes and/or services which were developed, but could not be commercialised. Firms must actively manage retention of such knowledge, which can be reactivated by internalising it again through experience and processes (Argote et al., 2003; Marsh and Stock, 2006).

P3 Agile services can be successfully delivered if SOA-enabled internal environment insight capabilities are deployed.

3.4 Service agility responding capabilities

The concept of responding capabilities has been identified as an essential feature of an agile organisation (Christopher and Lee, 2004; Dove, 2005). The responding capability transforms the knowledge in the organisation about specific product or service into action (Gattiker et al., 2005; Haeckel, 1999). Li et al. (2008) mentioned that responding capabilities are the change-enabling capabilities that are embedded in organisation’s processes. Thus responding capability can be defined as the ability of business process components to redesign and reconfigure individual processes, combining individual tasks and capabilities as per required changes in turbulent environment [Raschke, (2010), p.299]. In agreement with van Oosterhout et al. (2006), we have identified four activities for service agility responding capabilities. These activities as a part of service system, needs to be agile. These activities are service modelling, service configuration, service integration and service delivery. In the following sections we discuss all the four activities in detail.

3.4.1 Service modelling

Service modelling is also referred as service design in service science literature. In service design as conferred in service science literature, designer adopts a wide set of methods, approaches to understand services systems, context and experience. They
engage an actor’s intellectual resources and physical resources in co-designing. Service modelling is composed of three activities: service mapping, service simulation (to predict performance measures of service) and service optimisation (which is achieved through standardisation of business processes, rules of the services across the organisations and it helps in understanding the processes, the performance and standards) (Seethamraju and Sundar, 2013). Modelled service processes are eventually the dynamic configuration of resources that are designed to create value.

P4 Agile services can be successfully delivered if SOA-enabled service modelling capabilities are deployed.

3.4.2 Service configuration

Service configuration means the decoupling of the delivery of services from the time, when services were configured into an application or a system. As an activity of responding capability of service agility, this decoupling improves modularity of services and allows the services to evolve overtime independently. The service configuration also includes centralised administration of all the services it configures. This facilitates automatic initialisation and termination of the services. It can optimise the performance by performing common service initialisation and termination activities.

P5 Agile services can be successfully delivered if SOA-enabled service configuration capabilities are deployed.

3.4.3 Service partner integration

Service partner integration concept is derived from the concept of service networks. In networks, entities combine their strengths through direct and indirect connections to ensure enduring competitiveness (Barile and Polese, 2009). When customers’ needs change, some facilities in the organisation may not have the required competency to deliver to changed needs. The companies at such time can form and reform various networked organisations, depending on the customers’ changed needs.

P6 Agile services can be successfully delivered if SOA-enabled service integration capabilities are deployed.

3.4.4 Service delivery

The last activity of service agility responding capability is launching/delivering the service in the market and commercialising the same rapidly. It includes three activities: service rollout, service marketing and service monitoring.

- **Service rollout:** rollout is the initiation of service delivery. Tasks in this activity include rollout strategies, rollout time, training employees, and producing a starter kit (for example, producing brochures, forms, process instructions, and service contents). For agility, speed is the key element.

- **Service marketing:** service marketing addresses four elements: product, price, place, and promotions, which are similar for marketing of products.
• Service monitoring: it is necessary to measure the company’s overall performance with the new service process regularly, and also to improve on it continuously.

P7 Agile services can be successfully delivered if SOA-enabled service delivery capabilities are deployed.

3.5 SOA as an enabler: role of technology in enabling service agility capabilities

Literature refers to positive role of information technology in increasing organisation’s agility. Sambamurthy et al. (2003) recognised information systems as an important enabler of agility. The role of technology in responding capabilities has been studied extensively. Technology like ERP, CRM and SCM was adopted and implemented in the organisations. They exist in silos and hence a valuable insight that can be possibly be generated by integrating these information is lost. SOAs flexibly create information systems from such independent e-business systems (Leymann, 2003; Krafzig et al., 2005). SOA has been defined as a business-oriented architectural style that supports organisational agility by encapsulating functionality in services (Agarwal et al., 2011). Collaborative architecture management and collaborative organisational infrastructure have been identified as enablers of service innovation and the role of SOA in service innovation has been explored. Richter and Basten (2014) in their exploratory findings claim that SOA and organisational agility are strongly connected and organisational agility is the main business benefit of adopting SOA.

Figure 1 presents the conceptual model, which is further explored to identify the constituents of service agility capability, agile services and enabling role of SOA in developing service agility capabilities.

Figure 1 Theoretical model depicting the role of SOA in agile services
4 Research methodology

4.1 Design and case selection

The primary purpose of the case study approach is to understand ‘how’ the case organisations developed SOA-enabled service agility capabilities and agile services. It is common in case research to use triangulation to extend and validate the data collected by using multiple sources of evidence (documentation, archival records, interviews, direct observation and physical artefacts) (Eisenhardt, 1989; Yin, 2003). Therefore, two cases have been used to triangulate the findings. Two cases have been studied in this research, as the analytical conclusions derived from two cases will be more powerful than coming from single case (Yin, 1994, 2003, 2013). Further thematic analysis was done to interpret the data.

The two cases were chosen as they were considered as a good example of the studied phenomenon. The selection of these organisations was relevant because these organisations have adopted SOA for more than three years. These organisations have identified clear roles and privileges for SOA-related processes. Since one service sector cannot address all the aspects of service capabilities and there are different ways in which SOA can address the service needs, therefore two sectors, telecommunication and travel were studied. Further, the access to these two organisations was obtained, and the purpose of the research matched the cases. Therefore, specifically these cases were examined.

The case background of the two cases is discussed in the next section followed by the details on data collection.

4.2 Case background

4.2.1 Case A: telecom

This telecommunication organisation was the first private and largest integrated telecom services provider with a footprint in all the 23 telecom circles in India. It operated through three units namely mobile services (mobile services over global system for mobile communication (GSM), telemedia services and enterprise services (broadband and telephone services and direct to home (DTH) services (and end-to-end telecom solutions) and global supply chain services. The project involved the integration of multiple systems including legacy applications such as Oracle Customer Relationship Management (CRM), Kenan Arbor Billing System and other applications which had to be integrated with the new/upgraded applications like SelfCare, Oracle eCRM, Kenan FX Billing System, common payment system, number management system and order fulfilment system. The organisation opted for SOA to support the dynamic nature of its business and also to encourage reuse of services.

4.2.2 Case B: online travel

This online travel organisation is the fastest growing online travel portal which started its operations in 2005 in India. SOA was introduced in 2009 in the organisation, when the senior management made decisions to extend the services. Different services like railways booking and bus travel bookings, multi-city bookings, advanced search facility for customers, multiple payment option, and providing mobile application were
introduced. The growth of customised travel itineraries, seek new technologies to provide the dynamic packages together for customer to make choices. All these offerings of the smart travel system enhance the quality of customer service. For, e.g., the traveller is travelling across many destinations using multiple modes of transportation. This required multiple integrations across hotels, airlines, railways along with the holiday booking in between.

5 Data collection and analysis technique

The evidence for this case was collected between the year 2012 and 2014, and was mainly based on records of interviews and documents (Yin, 1994) (Table 1). Interviews were conducted in:

1. different service divisions of the organisation, marketing, business planning and strategy, software development and products
2. partners of the organisation.

We interviewed eleven executives from the first case organisation and interviewed five executives from the second case organisations (Table 2). These executives were selected from different divisions and partners of the organisation. The length of the interviews ranged from 40 to 60 minutes. A semi-structured interview technique was used. Further, the follow up questions were asked.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Source of data</th>
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<tbody>
<tr>
<td>Data sources</td>
<td>Case 1: Telecom organisations</td>
</tr>
<tr>
<td>Number of interviews</td>
<td>11</td>
</tr>
<tr>
<td>Documents</td>
<td>74</td>
</tr>
<tr>
<td>Videos</td>
<td>20</td>
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<table>
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<tr>
<th>Table 2</th>
<th>List of interviewees: cases 1 and 2</th>
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<tbody>
<tr>
<td>Interviewees: Case 1</td>
<td>Interviewees: Case 2</td>
</tr>
<tr>
<td>Head, planning and strategy</td>
<td>Director, technology</td>
</tr>
<tr>
<td>DGM, information security</td>
<td>Manager, technology</td>
</tr>
<tr>
<td>Senior software engineer</td>
<td>Team lead, products team</td>
</tr>
<tr>
<td>Senior solution architect</td>
<td>VP, marketing</td>
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<tr>
<td>Manager, business intelligence</td>
<td>Manager, business analytics</td>
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<tr>
<td>Head, products</td>
<td></td>
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<tr>
<td>Senior solution architect</td>
<td></td>
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<tr>
<td>Head, MIS strategy</td>
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<tr>
<td>Business intelligence architect, Cognos</td>
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<tr>
<td>Manager, analytics</td>
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<td>Business analyst</td>
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Note: The duration of interviews varied from 40 minutes to 60 minutes. Face to face interviews and telephonic interviews were conducted.
The patterns and trends in the two cases were discovered using thematic analysis. Boyatzis (1998) mentioned that thematic analysis helps in interpreting various aspects of research topic, in form of themes. A theme captures the complexity of meaning within a textual dataset.

The thematic data analysis involves various steps. Preparing for analysis involved verbatim transcription of primary data. The interviews were transcribed using the audio files (.wmv files). Document analysis was done (74 documents in the telecom case and 68 documents in the online travel case). Video analysis (of the video imported from YouTube) was done using 20 cases. The same procedure of coding and annotating the video was followed for the travel case. The thematic analysis followed the theoretical focus followed in the conceptual model.

All the documents were checked for accuracy and read twice. This was done to ensure that the focus stayed within the scope of the study. The documents which were not relevant were eliminated.

The first wave deductive coding involved topic-based coding. The content-based auto coding was used to integrate material and ideas. Each data extract was carefully read for its semantic meaning and was bestowed appropriate code name which best reflects the essence of the extract. This process was followed until the saturation of codes was reached and no new code was generated. The codes were classified according to their characteristics and were given a code name. The cluster analysis of the codes was then performed to understand that the codes segregation. The list of possible codes was generated and the broad themes were inductively recoded. The coding scheme was further refined.

The review of coded data was done to identify similar areas and overlap. This helped to capture the important aspects in the data related to the research questions and represented some type of pattern. The retrieval of code and theoretical refinement was done. The assessment of themes was done to ensure that the experience conveyed by interviewees was captured in the themes. The connections, patterns and structures were interrogated and the coding was compared across whole dataset.

The patterns were identified in coding within the datasets. The patterns were obtained on the ‘how’ SOA helps in better service offering, better pricing and better promotion. The codes were integrated with analytical literature. The integration of the two cases confirmed the identified service agility capabilities and agile services.

6 Case study results

Agile services are delivered through agile operations, agile partnerships and agile organisation structures. Agile services are facilitated through the right mix of pricing, promotion and service offering. The right service offered with the correct volume and variety (expanded service portfolio), gives customers options to choose. In telecom case, the customer could build their own plans (my plan), i.e., service offering, which addresses their need of service and their ability to bear the cost of the same. Further this service offering can be dynamically changed on a monthly basis. Thus ‘my plan’ serves as a good example of agile services.
SOA helps in customisation of services, directly by the customers. As per head, products of the telecom organisation mentions that

“The customers now want to create their own services. By giving them an opportunity to mix and match the existing service plans, we give them not only flexibility to customize, but the satisfaction that they are using the services, exactly as they wanted to.”

In case of the online travel, the flight services involve the selection of one-way, round-trip or multicity/stopover. When the customer searches for the flight options, the options across all the flights with their pricing and promotion gets displayed. This includes major domestic full service and low cost airline. The global distribution system (GDS) is integrated with the pricing engine of the smart travel portal and the related promotions are also shown to the customer to make choices. The vice president, technology mentioned that

“We provide our customers with a wide selection of airline tickets. We obtain the inventory from these airlines, either through a GDS (we primarily use the Amadeus GDS) or via ‘direct connects’ to the airline booking systems.”

The hotel services involved the selection of the hotels from the list of 11,400 hotels and guesthouses. The hotels were generally chosen based on recommendation systems and ratings. The vice president, technology mentioned:

“We procure room inventory from our hotel suppliers through three methods: ‘direct allocation’, ‘direct connects’ and, for most hotels outside India, through contracts with online travel agents and aggregators.”

The customised search interface helped in quick search of tickets for preferred travel dates, destinations and class of travel. The presentation of the information was clean and intuitive and helped the customer make a choice, after making comparison of available options. The packages involved integration of flight, hotel, car and other services. The dynamic packages involved multiple travel agencies and multiple stages of transfer of information. The information is passed in a staged manner. The different systems such as GDS, hotel transaction systems, internal systems and other systems were integrated.

In the telecom case, the pricing was based on usage and location, which helped the customer gain the maximum flexibility. Dynamic pricing helped the customer to utilise the non-peak hours. The pricing is decided on the basis of customer feedback, understanding the customer needs and choice. The organisation provided flexible pricing to their customers as per usage and they also allowed them to customise their price packs.

For online travel case, the dynamic pricing was introduced in case of flight services. The manager mentioned: “the rules governing the pricing of that flight may undergo frequent modification. Such real time management of rules and push-pull model is facilitated through SOA”. For hotels, the pricing depended on the demographics, the holiday seasons and the festivals, which is flexible in nature. For the package service, there is an integration of all the components included in the package and discount is provided for the same. For the railways services, the dynamic pricing has been introduced by the government of India in the year 2015–2016, which was incorporated by the online portal. The promotion is generally in the form of the new offering, changed pricing, new promotions, and is delivered quickly to cater to changing needs of the customers.
Table 3
Theoretical consideration of data: case 1: telecom

<table>
<thead>
<tr>
<th>Codes</th>
<th>Sub-theme</th>
<th>SOA theme</th>
<th>Service agility capabilities</th>
<th>Literature evidence</th>
</tr>
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<tbody>
<tr>
<td>The organisation activates three to four million new customers per month. “Without SOA, adding three million customers per month would be a stretch”, says Mr. Shah. “SOA is an enabler of our hypergrowth”.</td>
<td>Adding customers</td>
<td>SOA helps us to understand the customer needs and add new services rapidly</td>
<td>Market and customer insight</td>
<td>Dinter and Stroh (2009)</td>
</tr>
<tr>
<td>We brought different teams together and ensured that there is enough cross-fertilisation and a common architecture that everybody signs up to because mismatches could lead to gaps in the systems.</td>
<td>Cross fertilisation of teams</td>
<td>SOA helps us to efficiently utilise the teams merit and conduct internal company discussion to understand service needs</td>
<td>Internal environmental insight</td>
<td>Müller et al. (2010) and Antikainen and Pekkola (2008)</td>
</tr>
<tr>
<td>The integration happens really fast. There are checks and then it happens. The integration is tough. There is a business case with marketing team. Make shelf for promote the product. Can be easily integrated with technical system, then leakage check with revenue team. The interest with which do is very minimal. The design is not depending on revenue. Our app is not dependent on operator. Once we acquire platform, I can monitor through Playstores.</td>
<td>Integration</td>
<td>SOA helps in integration of services</td>
<td>Service integration</td>
<td>Malatras et al. (2008)</td>
</tr>
<tr>
<td>Yes it will differ. We have got the middle layer and SOA layer. We can put them in one building block. You cannot put too many components in one block. Componentisation is important, or something customer facing should be managed based on business needs.</td>
<td>Componentisation</td>
<td>The componentisation of services is enabled by SOA</td>
<td>Service configuration</td>
<td>Bieberstein et al. (2005) and Bahri et al. (2007)</td>
</tr>
</tbody>
</table>
Developing SOA-enabled service agility capabilities

### Table 3: Theoretical consideration of data: case 1: telecom (continued)

<table>
<thead>
<tr>
<th>Codes</th>
<th>Sub-theme</th>
<th>SOA theme</th>
<th>Service agility capabilities</th>
<th>Literature evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>The rules engines, is used for this. The rules are defined. Ilog is</td>
<td>Governance</td>
<td>SOA helps in governance of</td>
<td>Service governance</td>
<td>Joachim et al. (2013) and Varadan et al. (2008)</td>
</tr>
<tr>
<td>is used and there is also usage of prolog. One of the famous</td>
<td></td>
<td>services</td>
<td></td>
<td></td>
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<tr>
<td>programming logic is prolog and there are set of constraints.</td>
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<tr>
<td>There is an interpreter which checks the constraint and the</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>program searches for parameters. The system specifies the rules</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>in prolog. So when a person sets his own plan, the rule engine</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>matches the constraints and the plan gets decided according to</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>that. That is what enables us to provide a great quality of service</td>
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<tr>
<td>at a low cost to our customers. With our SMART SOA, our business</td>
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<tr>
<td>runs like clockwork.</td>
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<tr>
<td>The Comverse professional services team worked with the organisation</td>
<td>Scalability</td>
<td>SOA helps to scale services</td>
<td>Service configuration</td>
<td>Papazoglou et al. (2008)</td>
</tr>
<tr>
<td>staff to design and develop a world-class billing operations</td>
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<tr>
<td>organisation across India for comprehensive day-to-day support of</td>
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<tr>
<td>its Kenan BP billing engine and Kenan order management systems.</td>
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<tr>
<td>Since heavy users comprise only 15–20% of the population the other</td>
<td>Dynamic promotion</td>
<td>SOA helps in dynamic promotion</td>
<td>Service configuration and</td>
<td>Malattas et al. (2008) and Oh et al. (2007)</td>
</tr>
<tr>
<td>segment cannot be neglected. The population, which has just</td>
<td></td>
<td></td>
<td>service integration</td>
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<tr>
<td>realised the importance of cellular phones has to be roped in. It</td>
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<td>is for this reason that the service provider offers a plethora of</td>
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<td>incentives and discounts. These discounts are packaged with the</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>products. The dynamic combination of promotion and the products</td>
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<td></td>
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<tr>
<td>is done through SOA.</td>
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<tr>
<td>Real time pricing is obtained in the case of my plan. The customer</td>
<td>Real time pricing</td>
<td>SOA helps in real time pricing</td>
<td>Service configuration and</td>
<td>Papazoglou et al. (2008)</td>
</tr>
<tr>
<td>can choose from available schemes.</td>
<td></td>
<td></td>
<td>service integration</td>
<td></td>
</tr>
</tbody>
</table>
Table 4: Theoretical consideration of data: case 2: online travel

<table>
<thead>
<tr>
<th>Code</th>
<th>Sub-Theme</th>
<th>Theme</th>
<th>Service agility capabilities</th>
<th>Literature evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>With market research activities, we analysed data to understand price offerings, service levels and product features offered by various competitors. Dashboards were formed on BI tools based on SOA.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Market information</td>
<td>SOA helped in using market Information</td>
<td>Market and customer insight</td>
<td>Mahadevan and Kettinger (2010)</td>
</tr>
<tr>
<td></td>
<td>Regulation</td>
<td>SOA helped in implementing regulation</td>
<td>Service governance</td>
<td>Joachim et al. (2013) and Varadan et al. (2008)</td>
</tr>
<tr>
<td></td>
<td>Integration of systems</td>
<td>SOA helped in integration of systems</td>
<td>Service integration</td>
<td>Löhle and Legner (2010)</td>
</tr>
<tr>
<td></td>
<td>Process time</td>
<td>SOA helped in lowering process time</td>
<td>Service delivery</td>
<td>Rabhi et al. (2007)</td>
</tr>
<tr>
<td></td>
<td>The pricing data is stored in four servers, which are integrated through SOA. SOAP calls to request pricing data from the GDS.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Integration of pricing systems</td>
<td>SOA enables pull and invoking price-based data on the basis of rules</td>
<td>Service configuration and integration</td>
<td>Papazoglou et al. (2008)</td>
</tr>
<tr>
<td></td>
<td>Pricing a flight is a matter of finding the combination of discounts and restrictions that yield the lowest price...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bundling price and promotion together</td>
<td>SOA enables pull and invoking price-based data on the basis of rules</td>
<td>Service integration</td>
<td>Papazoglou et al. (2008)</td>
</tr>
<tr>
<td></td>
<td>The localised promotion helps and is facilitated through language-based web services...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Localisation</td>
<td>SOA helps in offering promotion based on localisation, customer demographics and usage</td>
<td>Market and customer insight</td>
<td>Mahadevan and Kettinger (2010)</td>
</tr>
</tbody>
</table>
Developing SOA-enabled service agility capabilities

For telecom case, the promotion is provided by bundling of products. Example of the bundling of products was designed by bundling additional data services, long distance calls with the local calls. This helped the organisation to pleasantly surprise their customers. For the online travel case, the localised promotion was provided to customers based on their demographics, usage of the applications, and loyalty. The promotions were provided through deals, coupons and dynamic promotions for customers. The theoretical consideration of the telecom case and the online travel case in terms of service agility sensing and responding capabilities is illustrated in Tables 3 and 4. The evidence found for each proposition is discussed.

P1: Agile services can be successfully delivered if SOA-enabled customer and market insight capabilities are deployed: service organisations have been using data analytics and business intelligence, to understand the client behaviour and segment customers to provide customised services. Location analytics based on geographic location helped to optimise the infrastructure for telecom organisation and segmenting customers for online travel organisation. Further the customer segmentation was carried out on the basis of online and offline channels. The business intelligence tools such as Quikview were enabled by SOA and in use.

SOA helps in understanding the customer needs. SOA helps in managing large volumes of data and integrating different business units. Business intelligence for customer needs was facilitated by SOA. One of the excerpts given on customer insight capability by the deputy general manager emphasised that “if we come with offerings, emanating from core products and services. The customers also get segmented. There are a couple of things that telecom companies do. One is user segmentation. What are you are offering and I am using. 0–50 minutes... In form of buckets. How this usage is flowing through existing networks? 0–3 hr… that gives the usage based on location. We apply analytics to such data to get meaningful information about the customer needs”.

P2: Agile services can be successfully delivered if SOA-enabled external environment insight capabilities are deployed: the telecommunications case organisation identified important regulatory changes, e.g., the shift from 1G, 2G to 3G and 4G and significant changes from voice only to voice also networks. The need to address different geographic languages resulted in creation of new services. The process of change is often uncertain, volatile and is accompanied with interventions in the form of new applications. In India, the telecom sector is growing very fast and is supported by regulatory changes. For the online travel organisation, compliance in terms of Payment Card Industry Data Security Standard (PCI DSS) is required. The payment gateway service was modified based on the payment PCI guidelines. In our research, we did not find enough evidences of how SOA enables the same and hence we are not in position the proposed whether SOA enables it or not.

P3: Agile services can be successfully delivered if SOA-enabled internal environment insight capabilities are deployed: internal environmental insight is defined as the systemic insight and exploiting the internal knowledge through entrepreneurial alertness at all levels of management. The dashboards are built in organisations, to help in disseminating information about changes across the departments and helps in exploring new opportunities. For the online travel organisation, the dashboards were created for the management, for the decision of pricing and promotional activities and types of services.

The key capability of SOA is to leverage existing assets, and dynamically connecting to different application protocols. In case of any services, which are created using
company’s internal knowledge resources, SOA helps in fast turnaround of such services. The CIO mentions that “we are ready to dish out new, innovative ideas. Our strategy is to provide digital lifestyle services across the three screens: the mobile, the TV and the PC. And our existing capabilities help us deliver that”.

**P4**: Agile services can be successfully delivered if SOA-enabled service modelling capabilities are deployed: the designing of services based on business requirements, was understood through the process of modelling, simulating and optimisation. In the travel case, the modelling of the services was done based on the ‘what-if analysis’ and the services were designed based on this analysis. SOA helped in addressing process flexibility in the organisations and with partners. SOA provides the rapid evolution of a design through modelling activities.

The software developer of the telecom organisation asserted that “the modeling and simulation of services help in understanding of processes. For, e.g., in the rules engine the rules are defined. Ilog is used and there is also usage of prolog. One of the famous programming logic is prolog and there are set of constraints. There is an interpreter which checks the constraint and the program searches for parameters. The system specifies the rules in prolog. So when a person sets his own plan, the rule engine matches the constraints and the plan gets decided according to that. This process is first modeled and simulated before actually being implemented”.

**P5**: Agile services can be successfully delivered if SOA-enabled service configuration capabilities are deployed: A firm can exploit an opportunity to the fullest if it can (re)-configure the resources based on the service need. The important aspect of the (re)-configuration component is that it helps in mapping the specific processes wherever required. One of the examples of service configuration in the telecom organisation is of recharging the prepaid connection. This is one example in real time, where the technology alignment helps in achieving a (re)-configured service.

Further, measures and metrics helped in keeping a check that the reconfigured service is appropriate and is performing the process as per design. Another example is scaling up a service, which requires multiple reuses of specific service configuration. The excerpts by the senior engineer, telecommunications organisation, shows that reusable asset specifications are prepared in the organisation for finding which service can be reused. For the travel case, the services are designed in a modular manner such that the reuse of the services is made possible. The head of products mentions that: “we have made the dynamic header and footer based on role and privilege user has, and served the page in a very small latency by caching data”.

The standardisation, scalability and modularity of services in an organisation are facilitated by SOA, which helps in internal and external integration. The code of the service is wrapped and mapped into components. The components are then managed in the form of modules. These modules act as reusable services with a service interface. These interfaces facilitate interoperability. The general manager of the telecommunications firm mentioned that: “soon there will be 600 to 800 reusable services that will be part of the system. The data collected through these services will migrate into the dashboard as well as into an analytical solution framework, which we will be building with analytics tool”. This portrays that, with better configuration, a newer service delivery can be done.
P6: Agile services can be successfully delivered if SOA-enabled service integration capabilities are deployed: knowledge partnerships enable innovation in services and technology partnerships. This enables process integration from both sectors. A technology partnership has been often in the form of outsourcing contracts with multiple service providers, who provided different competency-based services. Collaborative partnerships with suppliers, customers and competitors were also formed, where multiple partners can interchange their information with the help of technology or different delivery platforms. A service layer is created for the partners, so that they can wrap their legacy code and convert them into services. These services can then be reused, the need arises. The efficiency of the partners is maintained through different models, which force the partners to be efficient, with the reuse of existing services. For the online travel case, there is an integration of more than 200 systems and there is a single sign on for the systems. Around 45 application programming interfaces (API's) are specified for the payment gateway.

P7: Agile services can be successfully delivered if SOA-enabled service delivery capabilities are deployed: service rollout involves rollout strategies, rollout time, training employees, and producing a starter kit. Technology platforms help in big way for rolling out online services. The manager, service delivery of the telecom organisation mentioned that “service delivery platform (SOA) helps the organisation to manage the infrastructure. SOA also helps in faster service rollout”. Further for both cases, the time for service rollout and service marketing has been considerably reduced. There is a better notification system and integration across several channels.

7 Discussion

Synthesising and extending the existing work in the agility and SOA domain, an approach was proposed to better understand the agile services and SOA-enabled service agility capabilities. Empirical work suggested that greater insight into how SOA-enabled service agility capabilities enriched the literature, as six out of seven propositions found evidence in this study. Further a new capability, service governance capability was found as an important service agility enabler.

Service governance is an important capability in understanding the rules of the services, stakeholders, and also in managing relationships in the context of changes in the services. Service governance is extremely important while exposing the service to the partners and other systems. It is also important to make policies work in terms of procedures and standards in implementing it. In both cases, the roles and privileges for exposing the services are clearly charted out. The organisations work with open systems as well as proprietary systems and governance is an important mechanism to manage the partnership.

SOA follows the governance principles, since it is based on the reusability logic. Therefore, SOA governance helps in service governance as well, which includes service identification of single services, service integration, and managing organisational structure based on service needs. Specifically, governance in terms of structures, processes and relationship of customers with services is facilitated through SOA.
Excerpt of the manager from the travel case portrays the service governance capability. “Regulatory regimes vary widely, for example, and sometimes, the technologies must work with more than one language – such as using English, Hindi, Bengali, etc. The only debate when we go to a specific country is on how we deal with those nuances”. The introduction of service contracts has also improved the governance in terms of offering more secured transactions. Therefore, a new proposition can be proposed.

P8 Agile services can be successfully delivered if SOA-enabled service governance capabilities are deployed.

Table 5 mentions all the propositions and whether it found support in this study or not.

<table>
<thead>
<tr>
<th>Propositions</th>
<th>Support through case</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1 Agile services can be successfully delivered if SOA-enabled customer and market insight capabilities are deployed</td>
<td>Yes</td>
</tr>
<tr>
<td>P2 Agile services can be successfully delivered if SOA-enabled external environment insight capabilities are deployed</td>
<td>No</td>
</tr>
<tr>
<td>P3 Agile services can be successfully delivered if SOA-enabled internal environment insight capabilities are deployed</td>
<td>Yes</td>
</tr>
<tr>
<td>P4 Agile services can be successfully delivered if SOA-enabled service modelling capabilities are deployed</td>
<td>Yes</td>
</tr>
<tr>
<td>P5 Agile services can be successfully delivered if SOA-enabled service configuration capabilities are deployed</td>
<td>Yes</td>
</tr>
<tr>
<td>P6 Agile services can be successfully delivered if SOA-enabled service integration capabilities are deployed</td>
<td>Yes</td>
</tr>
<tr>
<td>P7 Agile services can be successfully delivered if SOA-enabled service delivery capabilities are deployed</td>
<td>Yes</td>
</tr>
<tr>
<td>P8 Agile services can be successfully delivered if SOA-enabled service governance capabilities are deployed</td>
<td>Yes</td>
</tr>
</tbody>
</table>

8 Theoretical contribution

This research paper defines service agility capability, constituents of the same and agile services. Since there is gap in literature in defining the above mention concepts case-based approach is followed to find support for the same. Literature helps in defining constituents of agility capabilities, and another important concept taken from literature is service dominant logic that takes the knowledge (resource) and process view of services and co creation of services with the customer. Thus components of agile services have been defined by referring to agility literature and S-D logic literature. Literature also provides evidence of how SOA enables these capabilities but very few papers have discussed the same.

Thus in this research two service companies who have implemented SOA for at least five years were taken. Through qualitative research methodology evidences and support of service agility capability, agile services and SOA enablement is explored. Interviews,
documents and archival records of two selected cases were referred to do the content analysis. The content analysis of the data collected results in identification of the key themes of the three research question. The results supported the seven service agility capabilities. Also one new capability, i.e., service governance was also discovered. The content analysis also found support for agile services and SOA enablement of service agility capabilities and agile services. Our model is parsimonious and provides a conceptual framework to understand the customer’s service needs and respond to them and enablement of same through SOA. Further evaluation of this model can be done to improve its applicability to other service-based businesses.

9 Practical implications

The service agility capabilities summarised in this paper will help the Indian service industry have a better understanding of the capabilities they need to develop in order to cater the customers with dynamic service offering, pricing and promotion. The identified capabilities show the direction to information technology strategists to develop the required capacities in the organisation. Moreover, the results of this paper help service organisation take decisions regarding service design, when they respond to the service needs. Furthermore, it motivates the services to enhance the collaborations and integrate services to respond to the service needs sensed through customer and environment insight.

10 Conclusions

The research suggests that it may be valuable for the organisations to consider the various service agility capabilities over long term. There is evidence that these service agility capabilities help in delivering agile services and hence make the organisations competitive. The empirical evidence also shows that the optimisation of time and the surprise to customers is an added advantage provided by these service agility capabilities. The use of a two case studies in this research methodology limits the generalisability of the findings. However, this research provides a conceptualisation of agile services and its antecedents from the service provider’s perspective, as well as finds empirical support for the same. In-depth interviews with the managers of a major telecom service provider and their partners helped us to understand the ecosystem of the service provider. Thus the collected data and the conceptualisation are able to explain the phenomenon in real life. Seven propositions were constituted from the study, which could be further validated in the future research.

Further research is needed to test the proposed model of agile services in terms of its ability to impact the desired outcomes like competitiveness which has not been studied in this research. The dimensions of this case can be used as constructs to build the measurement model, to be tested more rigorously. Further, the difference in performance between those firms which adopt SOA and those which do not adopt SOA can be explored.
References


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