Received 6 October 2014
Revised 22 February 2015
12 July 2015
23 August 2015
Accepted 2 September 2015



# Strategies in managing risks in the adoption of business analytics practices

## A case study of a telecom service provider

Amrita Gangotra and Ravi Shankar
*India Institute of Technology, New Delhi, India*

### Abstract

**Purpose** – There are various risks that can derail the adoption of business analytics (BA) practice in a telecom service provider (TSP) thereby jeopardising the possibility to increase profitability and improved customer experience. The purpose of this paper is to analyse different associated risks using situation-actor-process, learnings-actions-performance (SAP-LAP) model and build mitigation strategies for the adoption. Also the risks are ranked using the interactive ranking process (IRP) methodology and the dominating matrix provides insight to the actions and actors that need attention to improve the processes and performance.

**Design/methodology/approach** – A case study of a TSP (X1) was analysed through close interactions with experts within the company and externals involved in setting up the BA practice in X1. Using the SAP-LAP framework risks were identified and then the IRP was used to rank the actors w.r.t performance and actions w.r.t processes.

**Findings** – X1 has taken initiatives for setting up the BA practice in order to improve the profitability and customer experience through data insights. The suggested conceptual SAP-LAP model helps to address risk mitigation strategies for its adoption and the IRP frameworks helps in understanding the prioritisation matrix (using the ranking) to be considered to mitigate the risks.

**Research limitations/implications** – The IRP framework is limited to certain relationships between actors, w.r.t processes and actions w.r.t performance for the prioritisation matrix of identified risks. This has scope to be further expanded to other relationships and therefore refining the findings. Also this approach could be used to study other industries too.

**Practical implications** – SAP-LAP model identifies the risks in adopting the BA practice in a TSP. The synthesis of SAP leads to LAP, which bridges the gap by suggesting improvement actions based on the learning from the present situation, actors and processes. IRP provides the prioritisation matrix for mitigating the risks by identifying the dominating factors.

**Originality/value** – BA practice plays a dominant role in a TSP. An approach to study the risks of its adoption using the SAP-LAP and IRP framework bridges the gap between the academic and corporate world. This paper is very relevant to managers involved in setting up a BA practice. For the academic, use of research model validates the identification of risks that are recognised in the corporate world and prioritising the risks that need to be addressed.

**Keywords** SAP-LAP, Adoption, IRP, Business analytics, Risk mitigation strategies, Telecom service provider

**Paper type** Case study

## 1. Introduction

Business Analytics (BA) is the combination of process, disciplines, organisational capabilities and technologies associated with the collection and integration of business performance data; providing access, visualisation and delivery of actionable via key performance indicators (KPIs) to decision makers (Laursen and Thorlund, 2010). BA is a practice being adopted by organisations to extract relevant information using different approaches such as descriptive analytics, predictive analytics, prescriptive

Journal of Enterprise Information Management
Vol. 29 No. 3, 2016
pp. 374-399

1741-0398
DOI 10.1108/JEIM-10-2014-0096

analytics, data mining, etc. to make business decisions. Due to the advancement of technology, large amounts of data can now be mined and modelled to create "what if" scenarios and statistical and predictive models. Besides implementing the tools, organisations are employing statisticians and putting together a dedicated team to make it a way of life in the organisation.

Typically, a BA process has to deal with a few closely related phases which need to answer questions like: why is it happening? (Statistical analysis); what if the trends continue? (Forecasting); what will happen next? (Predictive modelling); what is the best that can happen? (Optimisation and enhanced intelligence-based analytics) etc. The information technology tools used in analysing the data, storing and enabling the analytics processing through standard reports, ad hoc reports, exception reports, queries, alerts, etc. are also considered an important part of BA (Moss and Atre, 2003).

The telecom industry in India has come a long way from 2004, when the number of mobile connections took over the fixed-line connection for the first time. The Indian mobile subscriber base has grown by a factor of approximately 135, from 5 million in 2001 to 904 million in July 2014, making it the second largest in the world (COAI) (Telecom Regulatory Authority of India, 2014a, b report). When mobiles were introduced in India, the country was divided into 23 telecom circles and separate licenses were given out for each of the circles. From a monopoly till the early 1990s when mobile call rates were as high as nearly 1/3rd of a dollar per minute, the Indian telecom space has evolved into a vibrant industry with call rates as low as quarter of a cent per second. The mobile operators brought in innovations like outsourcing of networks, focus on prepaid, etc. to make the mobile services affordable to the masses. As a result, the prices declined significantly over the years and the base continued to increase. Additionally, the auction for additional licenses that took place in 2008 prompted a further spate of new entrants and price wars amongst the service providers. As a result, India currently has amongst the lowest average revenue per user across the world.

In this highly competitive environment and in an industry where the base product – voice has become a commodity, the service providers have to stay relevant to the users and innovate continuously to differentiate themselves from the competition. With the shift from voice to data and the increasing number of youth in the country, providing enhanced customer experience has become the core objective of the service providers. This could be through aggressive pricing, catering to the changing lifestyles, entering into new markets or collaborating with over the top (OTT) players to own the end-to-end experience. Hence, to cater to such a complex environment, it is essential that the primary and support activities of the organisation are focused on achieving these objectives. By using business analytical (BA) tools, the telecom service provider's (TSP) initiative for cost efficiencies or revenue generation can have a much more positive impact on the profitability and thus give it a competitive edge in the industry. Investments in tools have to be made after considering the return of investment (Irani *et al.*, 1997) but that is not enough to maximise profitability. A competency centre with the right skilled manpower is another critical factor for the successful implementation of BA. Setting up this practice in a concentrated mode with all tools, people and processes' working as a full time activity is what is required to build a BA competency centre, i.e. a dedicated practice.

BA is being applied to current internal processes to help reduce costs, improve efficiency and improve customer experiences by emerging market TSP in varied degree of maturity in the emerging and mature markets mostly using the data that is generated within their network. However, the important new issue for TSP is an

opportunity to generate new revenue by selling analysed and anonymised data to third parties for advertising or market research. This is an area that could also be of specific interest to mature market telecom operators considering that they are seeing a decline in revenues and are facing greater challenges from the OTT players like Google, Facebook, Amazon with their ability to target customers based on their profile, likes and dislikes, etc. The trends of adoption of the various technologies like 2G, 3G, 4G and smart devices in mature and emerging markets are different and hence the business analysis needs are different.

In this research, much effort has been put into elaborating the risks of ineffective implementation of the BA practice and ranking them in order of priority in which they need to be mitigated. To the best of our knowledge, there is relatively scarce literature related to risks in setting up a competency centre/practice for BA. There is research done regarding the implementation of business intelligence (BI) tools and IT systems. It is quite useful to build a managerial framework, using the methodology of situation actor process-learning action performance (SAP-LAP) and interactive ranking process (IRP), which has widely accepted as a holistic approach (Sushil, 2000a). Although, such analysis can differ from industry to industry, our focus is around the telecommunication industry, which has to deal with a large amount of data that gets generated.

There are three major objectives in this research:

(1) to understand the risks in adopting the BA practice for a TSP;

(2) to develop a case study using the SAP-LAP framework for the risk mitigation strategies; and

(3) to develop a prioritisation matrix of the various risks that are identified and the managerial implications using IRP.

## 2. Literature review

The literature review covered three main areas of publications and paper:

(1) the evolution of BI and BA;

(2) the SAP-LAP and IRP frameworks research done in various areas like supply chain, BA/intelligence, service and manufacturing industries; and

(3) critical success factors (CSF), challenges and opportunities in implementing BI/analytics in an organisation.

BA is often confused with BI both in literature and practicing world (Casado and Raisinghani, 2004). BA has a more rigorous and systematic deployment of tools for mining of the data that has been generated during the past operation of the business. Mined data is used by evolving different future scenarios through the predictive analytics and therefore gaining information for taking correct decisions (Kohavi *et al.*, 2002). Automated workflows designed to action these decisions are called prescriptive analytics. BI on the other hand focuses mainly on developing intelligence in the decision-making process through descriptive analytics or post event analytics. In this sense, BA has evolved through BI. BI evolves to BA when there is a dedicated practice that has moved to more automation and better forecasting models (Laursen and Thorlund, 2010).

Some research is happening to study the impact of implementing the evolving technologies in the area of BA by most telecom companies across the world (Isık *et al.*,

2013; Lima *et al.*, 2009; Ganesh *et al.*, 2000). Integrating the data warehouse technology along with big data, visualisation technology and social media streams for the benefits of a telecom company is the way most organisations are building their strategies. The processes and people skills required to be make the implementation effective will be a major consideration during the study of this research.

Multiple studies have been done in analysing the attributes and factors towards successful BA implementations (Cavalcanti, 2005; Elbashir *et al.*, 2008; Mingwei and Guangxing, 2009; Isik *et al.*, 2012). Various risks may arise in the adoption of BA practice that could be due to inaccurate assumptions or beyond the control of the TSP. The SAP-LAP framework (Sushil, 1997), is an effective tool to describe the status of the managerial system and process. This tool covers three essential management perspective, i.e. situation, actor and process. This framework has been used widely by researchers in other areas eg. supply chain to study the risk factors (Mangla *et al.*, 2014). In the telecom industry this model has been used for the supply chain systems modelling (Pramod and Banwet, 2010). Using the IRP model with the SAP-LAP findings would provide the priority areas for a TSP to focus on to get the maximum impact from establishing the BA practice. The approach taken in this paper provides a practical guide to managers in the telecom industry. To the best of our knowledge, no study has been undertaken to use the SAP-LAP and IRP models in proposing the framework for mitigation risks while adopting BA practices in a TSP. Besides the afore mentioned research areas, the main area of research has been in understanding the challenges and opportunities in implementing advance analytics (Bose, 2009) and also the CSF for implementing BI (Yeoh *et al.*, 2008, 2010). Substantial amount of investments are being done by most TSP in BA in India and elsewhere with the strong belief that there is huge positive upside on the business performance and value that can be extracted by a successful implementation of this practice (Ishaya and Folarin, 2012).

Beyond literature review, secondary research work was also carried out. In order to make the research more relevant to the business world and the telecommunication industry, various industry research sites like TDWI report series were studied which stated that there is no silver bullet to the adoption of BA and it requires a lot of hard work and monitoring of best practices in order get good business value and return on investments (ROI).

Some of the major works undertaken by various authors, their field of study and key findings thereof are given before in Table I:

These research papers and others given in the reference section show the thought process used to conclude that frameworks of SAP-LAP and IRP have been successfully used in areas of SCM, IT implementations and manufacturing. The trend is now to set up the competency centre for BA in TSP and there is a research gap in risks associated and its prioritisation matrix to do this.

In depth research has also been done in measuring the success of IT implementation of BA in various industries and studying the risk associated. It can be concluded from the research literature reviews that there is a gap in researching the risks in setting up of a competence centre for BA especially in the telecom industry. The journals studied showed how the risks of setting up a green supply chain in a telecom industry can be identified and prioritised using the SAP-LAP and IRP frameworks. This provides a good direction that could be used to study the risks in setting up a competency centre for the BA in a telecom industry.

The research literature also shows that the dependency of using analytics for network planning and improving customer experience in a telecom industry is very

| S.No. | Author (s), year | Field of study | Key findings |
|---|---|---|---|
| 1. | Kumar (2008) | Impact of business intelligence system in Indian telecom | BI is an important tool for Indian telecom but many seem unaware of the benefits or are wary of the high cost of implementation. Factors critical to implementation have not been considered by the operators |
| 2 | Pramod and Banwet (2010) | Systems modelling of telecom sector supply chain: a SAP-LAP analysis | This paper demonstrate the use of SAP-LAP model for SCM in a telecom provider to understand the relationship between situation, actors, processes, etc. |
| 3. | Elbashir *et al.* (2008) | Measuring the effects of BI systems: the relationship between business process and organisational performance | This study reinforces the need to consider the specific context of use when designing performance measurement for IT-intensive systems, and highlights the need for further research for the realisation of such performance benefits. The business benefits is the focus in this paper and the risks associated was not discussed |
| 4. | Mangla *et al.* (2014) | A flexible decision framework for building risk mitigation strategies in green supply chain using SAP-LAP and IRP approaches | This paper shows how the SAP-LAP and IRP frameworks help in building risk mitigation strategies for supply chain. Similar concept was used to work on the risk mitigation strategies for the business analytics practice to be set up in a TSP |
| 5. | Laursen and Thorlund (2010) | *Business Analytics for Managers: Taking Business Intelligence Beyond Reporting*, published by John Wiley & Sons, Inc.; Hoboken, New Jersey | This book explains the concept of creation of a competency centre for business intelligence and taking it beyond just reporting. Based on this book and the trend seen within TSPs, the risk mitigation strategies for setting up the BA competency centre is a research gap |
| 6. | Yeoh and Koronios (2010) | Critical success factors for business intelligence systems | This paper focuses on CSF success factors in BI across different industries which is the basis of framing the risk mitigation strategy and the model. The CSF will be heavily dependent on successfully mitigating the risks that was addressed in this paper |

**Note:** Refer to the reference section for journal details

**Table I.**
SAP-LAP, IRP for BA practice in telecom industry

high in order to enhance its revenue growth. Thus identifying the risks in setting up a competency centre becomes quite crucial for the telecom industry. Developing a research-based frameworks for identifying the risks and knowing the priority in which to address them would be very beneficial for the telecom industry BI practice centres.

This research paper therefore addresses this gap to an extent and can be further developed as mentioned in the conclusion section.

## 3. Case study

A case study has been developed to gain deeper understanding of the system under study. The case organisation is a leading TSP of India (named X1 in the subsequent sections). The Indian telecom market is classified as an emerging market. It is growing very rapidly by acquiring millions of mobile subscribers (customers) on a monthly basis. This service provider is in a market that is predominantly prepaid markets and hence has very high churn factor, i.e. subscribers are price conscious and hence have a tendency to churn to other operators. Understanding the spend and usage profile of subscribers is important to retain them since the acquisition cost is always higher than retaining a customer. For that a huge amount of data generated with the network, i.e. CDRs (call record details) needed to be analysed along with data generated on Twitter, Facebook and other customer interaction channels. Therefore, it was imperative to implement IT tools that included data warehouse, dashboard and extraction, transformation and loading (ETL) systems. As in all IT implementation there are various risks that need to be mitigated in order to have an effective implementation (Moss and Atre, 2003). During the implementation of the BI IT tools, cross- industry standard process for data mining (CRISP-DM) was used to create the data mining models (Fayyad *et al.*, 1996). CRISP-DM consists of six major phases namely business and data understanding, data pre-processing, modelling, evaluation, deployment and feedback loops that are iterated over phases.

Qualitative case study methodology as described by Yin (1984), would generally be used for contemporary phenomenon in its real life context especially when the boundaries between the phenomenon and context are not clearly evident. He also said that the use of case study would become relevant in a research area where the researcher does not have to have control over the behavioural events. BA and the growth of the telecom industry in India are both contemporary phenomena and the single case (X1) selected for the research had unique characteristics like being the largest telecom in India and a forerunner in setting up the BA practice. Instrumental case study like this one is used to provide insight into an issue. The case (X1) plays a supportive role, facilitating our understanding of implementing BA practice in a telecom company. The case has been looked at in depth, its contexts scrutinised, its ordinary activities detailed. The case may or may not be seen as typical of other cases (Stake, 1995). Both Yin and Stake, suggest that the issues and propositions are crucial elements in case study research and that both lead to the development of a conceptual framework that guides the research.

For understanding the practices in the X1, we organised three workshops to explore the risks and other disruptive factors. Each of the participating members had relevant experience of 8-10 years in the area of BA tool implementation, statistical modelling and retention and usage modelling in X1 or other telecom companies. The expert panel also had a team from a leading consulting firm in order to boost the knowledge pool from other similar implementations worldwide. Also, implementation experience of the IT manager in the case company has been used. Panel of experts from other service providers were involved and a set of questions were posed to them to understand the various risk factors. The process used for risk mitigation was to first identify the risk situations that will impact a successful implementation and the adoption in the organisation. Thereafter, the prioritisation sequence of the risks and mitigation strategies were discussed.

### *3.1 Background of the case situation*

As the telecom industry moved from 2G to 3G/4G technologies, there was a huge explosion of data usage. Use of internet by people is penetrating deep into class B and C cities and

also rural towns in the Indian market. This in turn generates more data within the TSP network and on social media forums. Therefore the next phase of BA incorporates the need to implement "big data" technology in order to be able to process the volume of data with more real-time capabilities. This is the journey that is now starting in X1. The retention and acquisition strategies would therefore need to consider the voice and data usage profiles and trends of various subscriber segments. A study was conducted to gauge the value of the BA tools and big data implementation. While the IT tools were implemented as a major initiative, ongoing use by subject matter experts in a concentrated manner was envisaged as a major criterion to increase the business value of the investments.

A centre of excellence or a competency centre was set up as a practice which has dedicated users and managers with subject matter expertise (SME). These SMEs used data modelling and statistical knowledge using data from real-time feeds in order to interpret the information. By creating a shared services centre with highly capable experts, the repeatability of insightful models increased significantly. The operational users were able to consume the insights in a more real-time basis when it was interpreted at the competency centre. There were risks associated with the implementation of the BA competency centre in the X1 company in an effective manner. The major concern for this unit was to identify and mitigate risks in order to maximise the adoption of the BA practice so that the profitability and customer experience improved for this TSP.

### *3.2 Process followed for the research*

The above process was followed in this paper to reach the conclusions of the research.

## 4. SAP-LAP framework

SAP-LAP is a holistic framework that integrates the hard and soft system aspects. A management approach which is holistic and flexible in the light of the dramatic changes in external and internal factors in the telecom industries in an emerging market needs to be developed.

The SAP-LAP model helps the process of analysis and idea generation about the situation, actors and process and their interactions. This model also guides the process of synthesis in terms of key learning areas, action points and performance impact. The SAP-LAP model prepares the organisation for effective action in the ever changing external or internal situation. The model can be applied iteratively with each changed action or situation and a fresh inquiry can be made.

### *4.1 Conceptual model for building risk mitigation strategies*

In order to research the risk mitigation strategies for implementing an effective BA competency centre using the interplay in the SAP-LAP model, it is important to develop a framework. The SAP-LAP model was discussed during the workshop and the conceptual framework proposed by Sushil (2001a) was adopted to identify the risk and delve on the mitigation strategies Figure 1 is the resultant output (Figure 2).

### *4.2 Risk situation identification*

Risk of a successful implementation of the BA competency centre is a vital consideration in the adoption of the BA practices, as the inability of managing the risk

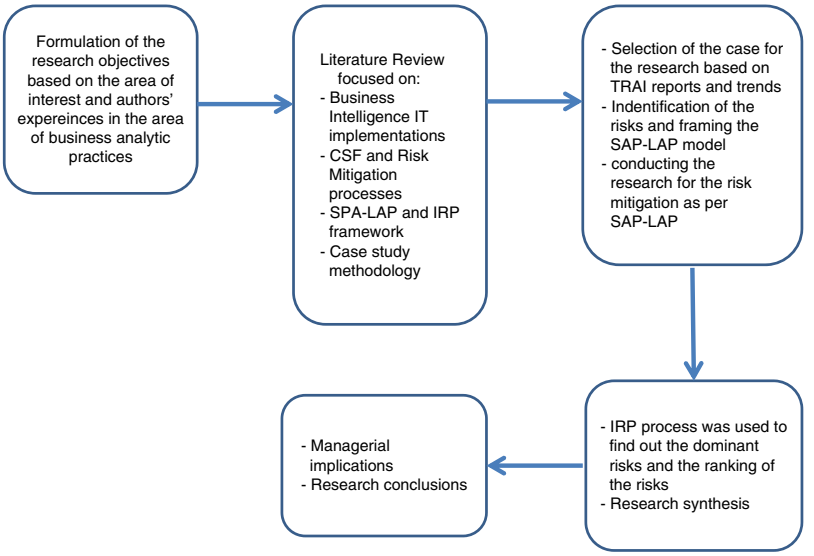
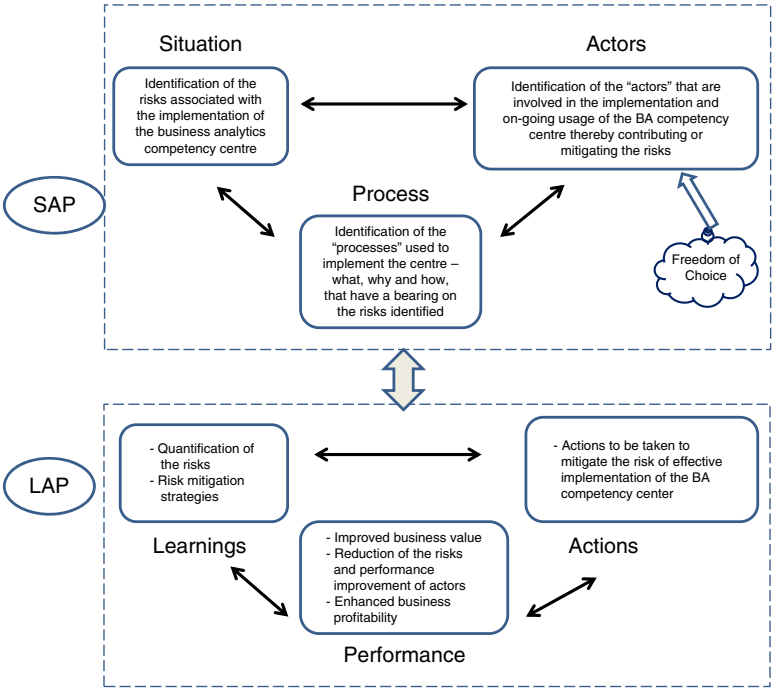



**Figure 1.**
Diagrammatic representation of the research process




**Source:** Based on Sushil (2001a)

**Figure 2.**
Conceptual SAP-LAP model for building risk mitigation strategies

would lead to reduced profitability and customer experience for the TSP. Analytics is key to insightful information and decision. Because of huge number of subscribers in a telecom industry it is not possible to gather insights from the vast amount of data that gets generated within its network and IT systems without a successful implementation of BI tool set and the processes to gather, extract and transform the data into insightful and real-time dashboards. People skill is another factor that contributes towards the framework of the BA practice.

In order to identify the risk situation, using the inquiry model of SAP-LAP, we try to analyse these questions:

- How did we reach here?
- What is happening now?
- What is expected to happen?

Table II presents the risk situations for the case company X1.

### *4.3 Actors impacting the risk identified*

During the identification of the risk, it was quite evident that the people aspect has a huge role in the implementation of the competency centre. Basis the case study and the SAP-LAP model of inquiry, identification of the actors are done through the exploration of the following questions:

- What are the world views?
- What roles and capabilities are exhibited?
- In what domains is the freedom of choice available?

BI systems when used along with real-time tools like hadoop, HANA and streams from Twitter and Facebook are able to provide more information to the user in an organisation which if processed by the competency centre would provide for meaningful insights. The main difference in implementation of the BA tools as an IT project and creation of the centre of excellence or competency centre for BA is the people involvement and their roles and capabilities. There are various factors that have been researched extensively in the area of assessing IT/IS success models (Watson *et al.*, 2004) and usually these become the first to be used and criticised in a failed implementation. The ownership of the success of the use of the IT tools for decision-making shifts from the technology teams to the business users and the subject matter experts if a competency centre-based approach is taken and a world (wider) view of the actors are taken. The creation of this centre or practice enables quality information in well-designed models. User friendly dashboards provide knowledge of various business processes in a timely and insightful manner that can quickly be turned into meaningful actions. Table III provides the details of the actors, their roles and capabilities within their domain of choice.

### *4.4 Process*

Risk identification is a process that focuses on events or triggers that might happen within the organisation or outside that could cause major or minor risk to the ongoing viability of the BA competency centre. Thus it is critical to adopt a well thought through strategy to mitigate these risks. Any mitigation strategy could be in proactive or reactive manner towards the event or trigger that may happen. Proactive approach

| S.No. | Situation cluster | Contributing factors | Issues – now and expected |
|---|---|---|---|
| 1. | Technology: internal implementation of the data warehouse, dashboards and ETL tools | IT architecture enablement<br>Adequate investment<br>Source system data quality<br>Quality of business requirements | IT project to implement business analytical tools have many contributing risk factors or situations. This is the first situation that needs to be dealt within order to reach the end-goal of implementing the competency centre |
| 2. | Technology: external impact of technology that is used and developed by others too | Social media feeds like Twitter, Facebook, customer forums<br>Capability of the tools implemented by competition<br>Companies that are working on improving business analytical tools or provide managed services | External technologies are evolving very rapidly and therefore the risks need to be monitored constantly to understand the current and futuristic changes. Also in the case study, through questionnaires, it was evident that effective implementation of tools and use of them to manage offers and churn if not monitored closely has the risk of unrealised return on investment |
| 3. | Process: internal change control mechanism to ensure effective use of the key performance indicator (KPI) dashboards | Change management<br>Use of the dashboard/KPIs in the business processes | The adoption of the BA practice will need evaluation of the current internal business processes and changes to the processes to make it more effective. Automation of the dashboards will enable "actors" to get more insights into the business processes. Inability to recognise the change management processes and use of dashboard will pose a huge risk in getting the full business value |
| 4. | Process: external increasing regulatory and competition pressures | Regulatory and security norm changes<br>Data collection process about competition offers and strategies | Impact of any major regulatory or security norms will continue to have a huge risk on the IT tools ability to make changes in an agile manner. The competency centre has a risk from impact of changes in competition data collection processes too |
| 5. | People: internal top management sponsorship for the tool investment, hiring highly skilled resources and | Top management commitment towards the creation of a dedicated competency centre<br>Statistical skill and | Risks associated with people will also have an impact on the research study of the "actors" that need to be involved in mitigating the risks of |

(*continued*)

**Table II.**
Identification of the risk situations

| S.No. | Situation cluster | Contributing factors | Issues – now and expected |
|---|---|---|---|
| | implementing a robust competency centre | dedicated resources in the competency centre<br>Analytical decision-making culture and political environment supporting this culture | building the excellence (competency) centre<br>Tools implementation will depend on the quality of the requirements specifications and the ability of the user community to use the tools in a competent manner. Per the case study, one of the major reasons for creating the dedicated competency centre for advanced business analytics is to have subject matter experts, statisticians and advanced users of the dashboards to maximise business value of the investments |
| 6. | People: external obtaining skilled resources from suppliers and partners | Skills of the system integrator<br>Outsourced agencies like distributors, call centres using the information | There is a risk of the quality and expertise of the people that are from external agencies that are part of the ecosystem to implement this competency centre and BA practice |

**Table II.**

includes actions that are or can be taken in advance to deal with the risks. This is a preventive approach and enables the avoidance of the risky event. One of the factors that has to be taken into consideration is probability of the event occurring and weighing the cost of eliminating or reducing the risks vs the impact of the event occurring. If the approach to mitigate is taken after the event occurs then it is considered to be a reactive approach. There are mainly two strategies that can be adopted to react to a situation – first is the response to the event, e.g. when the competition puts an offer in the market about which the competency centre did not think of but needs to react in order to avoid churn of customers from occurring. The other reactive approach is recovery from the situation which in effect sometimes becomes the retention activity by the operational managers.

While the mitigation strategies should focus more on the proactive measures, the reactive measures to respond and recover from an event should not be overlooked. An extreme form of risk recovery strategy is the disaster recovery strategy. Many times the investment required to react to event have also got be done well in advance so that the organisation has the capability to react when the event happen. This is called business continuity plan.

Again using the SAP-LAP model of Inquiry, the actors associated with the risk would answer questions such as:

- What is being done? What are the variables? What are the parameters? What can be changed?
- Why it is being done?
- How is it being done?
- Any other considerations?

| World view actors | Roles and capabilities | Domain available for freedom of choice |
|---|---|---|
| Top management | Sponsorship of the programme and monitoring of the business value | Top management decisions impact the entire being of the competency centre, so they have the maximum freedom of choice keeping in mind the profitability of the company and shareholder requirements |
| IT project team | On-time implementation and maintenance of the systems and tools | Freedom to choose the system integrators, consultancy firms |
| System integrators and consultancy firms | Architecting a flexible IT system and processes that will adopt to external and internal business changes | Are answerable to scope of work that is signed and delivery of the project on-time and within budget. Within that they have freedom to architect an agile and flexible system |
| Competency centre managers | Ensuring that agile processes and right experts are part of the centre in order to use the tools and respond the market and regulatory demands | Within the framework and objective of the competency centre, the managers have the freedom to grow the SMEs and improve processes for the day-to-day operations of the centre. The domain managed by the competency centre managers is core of the services provided to the other departments and absolutely critical for the success of this initiative |
| Competition | Competition will keep track of this organisations market movements/offer and counter propose | Competition has the freedom to create their own strategies to improve the profitability of their company which may or may not have huge impact on the case study organisation |
| Business managers consuming the dashboards in their processes | Use the insights and KPI dashboards being provided by the centre for informed decision making in their day-to-day operational processes | Business managers involved in the operational processed do have the freedom of providing feedback to the competency centre of the output and also reviewing the results but if there is top management sponsorship the degree of freedom to choose to use the services may be limited |
| External technology suppliers (vendors) | There are a number of innovative companies that constantly bring out more real-time and user friendly tool for analysing data. Technology vendors have made big strides in managing the volume, velocity and variability of telecom industry data. Tools in big data, visualisation, and what-if cubes tools are being matured by these vendors constantly<br>The other part of the technology vendors is the evolving technology in mobile world from 2G, 3G, 4G/LTE that will continue to bring more capabilities in the hand of subscribers and therefore more data to be analysed in a constant basis | The domain covered here is external to the organisation implementing the competency centre but may have a huge impact on it because of the freedom of choice that vendors have to continue to invest in R&D of more advanced tools |
| Customers consuming the offers and being retained | Customers will evaluate and consume the offers for enhanced usage | Customers have choices in the market place from competition and thus have a fair degree of freedom of choice |

**Table III.**
Actors and their freedom of choice

Process definition describes "what happens" within the organisation to build the competency centre that will confirm to policy and guidelines defined by the organisation. How the process is followed is described in procedures. The process for creating the strategies to mitigate the risks associated with the implementation of the BA competency centre was to identify the risks as listed in the situation section. A discussion was also carried out to list the possible unexpected events especially in the external environment.

The next important step of the process was to assign the probability values of the various risks bearing in mind the events that may occur. Impact analysis is a very necessary step in order for the organisation to rank order the risks that have the highest negative impact. Risk mitigation strategies must cover the proactive actions that can be taken to completely avoid the risks or create restoration and recovery plans for events that are beyond the control of the organisation and must be covered through a backup plan.

The final process is the monitoring of the risk situations. This will involve continuous reviews and supervision of the systems and competency centre operational activities in order to do timely detection of the risks. Table IV provides the strategies that can be adopted for proactive and reactive approaches.

### *4.5 Learnings*

*Learnings during the study of the situations for identification of the risks*. While it was quite straight forward to identify the external risks of technology evolution and regulatory changes that may have an impact of the implementation of the competency centre that can be differentiator for the TSP, the challenge was to identify the ongoing impact of the evolution (Manglik and Mehra, 2005). Impact of big data, visualisation technology and user friendly dashboard tools have a big impact on the implementation investment and legacy profile of the BA tools that are implemented within the organisation. It is not possible always to continuously upgrade or migrate from tools already implemented within an organisation due to investment ROI and inability to change the existing IT architecture. The risk becomes higher if competition is able to implement more mature and advanced tools as compared to the case study organisation.

Regulatory changes like spectrum auction, know your customer, number of campaign SMS and opt-in/opt-out consensus (TRAI, 2011, 2012) during the implementation of the BA models/rules had an impact of the IT implementation and the investment requirements of this X1 TSP. These changes also impacted the process used to collect source system data and approvals/decisions required by managers in the organisation.

Thus, in order to increase the adoption of the BA practice and create differentiation in the telecom market of India, it was important for the X1 organisation to understand the ongoing risks of implementing a BA competency centre and develop mitigation strategies that can be invoked on more real-time basis.

**Table IV.**
Process clusters

| Process type | Strategies |
|---|---|
| Proactive approach | Preventive strategies |
| | Protection strategies |
| Reactive approach | Recovery strategies |
| | Backup strategies |

*Issues related to actors*. Top management ongoing sponsorship is extremely critical for any IT implementation. In this case, it was quite evident that the sponsorship required extended towards clear direction when regulatory changes happened, providing the necessary investment to build the competency centre as a dedicated centre with trained statisticians and senior managers to govern and manage the competency centre. The other learning for the actors was that strong collaboration was required between the suppliers of the consultancy, system integrator, IT teams and the business users. Regular steering committee to monitor the project during implementation and thereafter to review the business decision on the campaign offers, conversion ratio and the churn figures across the various customer segments was mandatory in order maximise the ROI and to mitigate the risks.

Ongoing training of the analysts, statistician, data models and business users is required in order to mitigate the risk. Monitoring the implementations without focus on the people capability and upgrade of the skills would not lead to a holistic risk mitigation strategy. Since the skills people in the competency centre are quite in demand in the external market, the HR organisation should have a retention policy and attrition management strategy.

Monitoring and taking real-time decisions because of the ongoing changes in the regulatory and external technology environment and competition has to be the responsibility of the top management and the competency centre senior managers. Top management also have to make provisions for any unforeseen external events that may impact the BA competency centre.

*Learnings during the process of building the risk mitigation strategies*. To build the risk mitigation strategies for implementing and managing the BA competency centre the process must scan the situations in the external and internal environment. One of the learnings while following the process is that considering the impact of previous or current events only would not be a holistic approach and hence the future impact should also be considered. Creating the clusters for proactive and reactive approaches is useful in creating the strategies.

### *4.6 Actions*

Actions should be considered and acted upon to mitigate the risks. The actions can be built in consideration of the contributing factor towards the risks and the proactive and reactive processes that are defined in the risk mitigation strategies. Table V lists down the contributing factor towards the risks and the proactive and/or reactive actions that should be taken to mitigate these contributing factors. Dealing with the contributing factors through appropriate actions helps mitigate or eliminate the risks.

### *4.7 Performance*

Mitigating the risks on a continuous basis ensures the success of the implementation of the BA competency centre. The main contribution noticed were towards improvement of the revenue through effective campaign by significant improvement in conversion rates of the campaign offers sent to various segments of the customers by more uptake of the offer. Churn reduction also happened because the competency centre was able to profile the customers using the BA tools and relate the behaviour of the customers in the last three months to their earlier calling and data usage patterns. The competency centre developed models to spot patterns that contributed towards churn models and fed the output to the call centres so

| Risk Contributing factors | Actions to support the strategies | | | |
|---|---|---|---|---|
| | Preventive | Protective | Recovery | Backup |
| IT architecture enablement<br>Adequate investment<br>Source system data quality<br>Quality of business requirements | Partnership with experience SI, consultants<br>Minute focus on data quality and extraction, loading and transformation (ETL) process from source systems | Skilled and trained people<br>Constant monitoring of the return on investment | In case of delayed technology implementation, closer monitoring by steering committee is necessary<br>IT disaster recovery process and actions should be taken with the agreed recovery time | No possible backup strategies during implementation of the tools<br>IT data backup processes to be implemented to reduce risk of data loss |
| Social media feeds like Twitter, Facebook, customer forums<br>Capability of the tools implemented by competition<br>Companies that are working on improving business analytical tools or provide managed services | Much of this would not be possible to prevent | Market intelligence strategies would reduce the risk of unknown of competition actions and advance knowledge of the enhanced tools in the market place | Reaction to market offer by competition to be initiated by top management<br>Long-term plans to incorporate more advance tools on an ongoing basis based on the ROI | No actions possible |
| Change management<br>Use of the dashboard/KPIs in the business processes | Establish change management board<br>Monitoring of usage data | No action<br>Constant monitoring of offer conversion | No action possible | No backup to mismanaged change management process possible<br>Use source systems |
| Regulatory and security norm changes<br>Data collection process about competition offers and strategies | Use change management process to monitor<br>Establish market intelligence gathering process | React after the event to mitigate the impact | React after the event to mitigate the impact | No backup actions possible |
| Management commitment towards the creation of a dedicated competency centre<br>Statistical skill and dedicated resources in the competency centre | Collaboration and upfront support to be built of the top management, user community and senior manager of the competency centre | Invest in right skills | No recovery will be possible if top management is not collaborative or supportive<br>Hiring urgently for skill sets required | No action applicable |

**Table V.**
Actions to be taken to mitigate the risks that exists due to the contributing factors

(*continued*)

| Risk Contributing factors | Actions to support the strategies | | | |
|---|---|---|---|---|
| | Preventive | Protective | Recovery | Backup |
| Analytical decision-making culture and political environment supporting this culture | | | | |
| Skills of the system integrator<br>Outsourced agencies like distributors, call centres using the information | Get references for the SI<br>Communicate well and get the support of the distributors and call centres | Invest in the best-of-class | No action possible | Build adequate internal skills within IT department<br>Use select distributors and call centre to implement your plans |

**Table V.**

that they could attempt to retain the customers. Campaign offers specific to customers that may likely to churn from the service provider were created by the competency centre.

The impact on performance was studied post the implementation and running the competency centre for six months. Table VI lists the observations that were gathered through workshop and interviews of the actors.

## 5. IRP application

The SAP-LAP model as described above provides a holistic view of the possible risks and it mitigation actions that can be taken in order to make the implementation of the BA competency centre performance oriented. The SAP-LAP model also delves on the intuitive process because the research tools used are the workshop and questionnaire methods predominantly. The issue in the real world is that it may not be possible to implement all the risk mitigation strategies due to costs, environmental considerations, etc. Therefore prioritisation or ranking of the actions that should be taken to maximise the performance were studied as part of the research in this case study.

IRP was introduced and used as a flexible decision approach by Sushil (2009). This model linked with the SAP-LAP process helps in validating the intuitive portion of the model and provides a more rational approach to the decision making. This approach build on the strengths of the paired comparison approach (Warfield, 1974; Saaty, 1980) thereby reducing the cognitive overload. The limitations of the SAP-LAP model where the interpretation of the opinions and judgements of the experts remain invisible to the implementers is overcome by this method. The IRP model uses interpretative matrix and paired comparison as the basis for the interpretation of the prioritisation, which is based on the interpretive structural model (ISM). ISM and IRP relationship were delved in as an example by Haleem *et al.* (2012). The IRP model makes an internal validation check through the vector logic of the dominance relationships in the form of a dominance system graph. Applying the IRP structure from Sushil (2009) in this research, the steps were worked upon.

| Performance impact | Related risk mitigation actions | Performance output |
|---|---|---|
| On the situation | Risk mitigation strategies created around the technology implementation within the organisation and monitoring of external factors on the evolution of the technology | Timely delivery of the IT project within the investment profile |
| | Risk mitigation strategies created to monitor the competition landscape in this area and also the impact of the regulatory changes | Faster reaction and recovery positions possible thereby improving the churn to reduced or increase in the conversion rate of the offers |
| | Usage of the output by distributors, call centres and marketing department were monitored regularly | Empowered distributors and other partners of the service provider resulting in quicker actions. Ownership of the KPIs in a joint manner |
| On the actors | The top management and user community in this process were brought together in a more collaborative manner at a regular periodicity through steering committees | Better decision making, enabling the end results of enhanced revenues and reduced churn |
| | Supplier, consultant and system integrator skills were benchmarked with the external market availability constantly | Highly skilled and best-in-class external suppliers. Ability to reference the implementation with other telecom service providers |
| On the process | The process to take actions in proactive and reactive manner were clearly thought through and documented | Timely reaction to events happening in the external world and upfront knowledge of the internal risks that could derail the whole programme |

**Table VI.**
Performance results

Step 1: the first step was to identify the variables of SAP-LAP in building the risk mitigation strategies for the implementation and successful running of the BA competency centre. These are illustrated in Table VII.

Step 2: establish two sets of variables – one ranked with reference to the other. Based on the SAP-LAP model, the role of the actors with respect to the processes and the influence of actions on the performance were studied. The ranking of the actors w.r.t processes is discussed while explaining the application of IRP.

Step 3: the next step is to create a cross-interaction matrix between the two sets of variables. A cross-interaction matrix represents relationship between the two variables identified in the study. In this case it is actors vs processes and the actions vs performance. A "1" is used if there is a relationship otherwise a "0" is used to represent no relationship in the matrix. The binary matrix of variables and the interpretive matrix are represented in Tables VIII and IX.

Tables VIII and IX also depicts contextual relationship of the pair-wise comparison, e.g. Roles of actors in the various processes, similarly the influence of actions on the performance.

Step 4: the next step would be to find the dominating interactions using the experts' inputs. For that using the dominating interaction matrix as depicted below, the ranking of the domination of the various actors in the processes is found out. Table X depicts the dominating interaction matrix for actors w.r.t. processes and Table XI depicts the dominance matrix with the rank of domination. Tables XII and XIII, respectively are the dominating interaction matrix and dominance matrix for actions w.r.t. performance.

| Components | Variables | Description |
|---|---|---|
| Situation | S1 | Technology: internal<br>Implementation of the data warehouse, dashboards and ETL tools |
| | S2 | Technology: external<br>Impact of technology that is used and developed by others too |
| | S3 | Process: internal<br>Change control mechanism to ensure effective use of the KPI dashboards |
| | S4 | Process: external<br>Increasing Regulatory and competition pressures |
| | S5 | People: internal<br>Top management sponsorship for the tool investment, hiring highly skilled resources and implementing a robust competency centre |
| | S6 | People: external<br>Obtaining skilled resources from suppliers and partners |
| Actor | A1 | Top management |
| | A2 | IT project team |
| | A3 | System integrators and consultancy firms |
| | A4 | Competency centre managers |
| | A5 | Competition |
| | A6 | Business managers consuming the dashboards in their processes |
| | A7 | External technology suppliers (vendors) |
| | A8 | Customers consuming the offers and being retained |
| Process | P1 | Preventive strategy |
| | P2 | Protection strategy |
| | P3 | Recovery strategy |
| | P4 | Backup strategy |
| Learning | L1 | External technology changes and its adoption internally |
| | L2 | Top management, senior business managers and competency centre project manager commitment to the centre |
| | L3 | Hiring of best-in-class external agencies and internal resources |
| | L4 | Regulatory and competition activity tracking |
| Action (tasks) | T1 | Proactive and reactive actions for internal tool implementation and external technology changes |
| | T2 | Gather top management sponsorship through steering committees |
| | T3 | Establish change control board |
| | T4 | Establish competition, regulatory, security and other external agency intelligence gathering mechanism |
| | T5 | Monitor process effectiveness through KPIs and performance tracking |
| | T6 | Continuous hiring and training of internal people and external partners |
| Performance (results) | R1 | Increased conversion rate of the campaign offers |
| | R2 | Reduced churn of the customers/subscribers |
| | R3 | Better customer satisfaction |
| | R4 | Enhanced voice and data usage and therefore more revenues |

**Table VII.** Variables identified during the modelling of the SAP-LAP for this case study

Some observations during the creation of the dominance matrix is that if, two variables have the equal negative net dominance score or value, then the ranking is decided by the number of cases being dominated (Sushil, 2009). Like in Table XI, A2, A4 had the same score but A4 got a higher ranking on the basis of it having more number of cases being dominated than A2.

Step 5: interpreting the ranking order and then using it for recommending the prioritisation or selection of the actions is the next step. The ranking of the actor's w.r.t

| Binary matrix | | | | | Interpretive matrix | | | |
|---|---|---|---|---|---|---|---|---|
| | P1 | P2 | P3 | P4 | P1 | P2 | P3 | P4 |
| A1 | 1 | 1 | 1 | 1 | Clarity of Vision | Define objectives and provide investments | Respond to market conditions | Sign off on the contingency plan |
| A2 | 1 | 1 | 0 | 0 | Robust project plan | Regular monitoring of the project | – | – |
| A3 | 0 | 1 | 0 | 1 | | Constant monitoring of their performance | – | Alternate firms |
| A4 | 1 | 1 | 0 | 1 | Highly experienced manager | Incentive plans for the managers | – | Attrition strategy |
| A5 | 0 | 0 | 0 | 1 | – | – | – | React to offers made by them |
| A6 | 1 | 1 | 0 | 0 | Training of the users | Monitoring of the usage | – | – |
| A7 | 0 | 1 | 1 | 0 | – | Contracts to cover the penalty on non-delivery | Refocus on the steerco of the project | |
| A8 | 0 | 1 | 1 | 0 | – | Customer awareness | Tracking changing needs to customers | |

**Table VIII.** Binary and interpretive matrix between actors and processes

| Binary matrix | | | | | Interpretive matrix | | | |
|---|---|---|---|---|---|---|---|---|
| | R1 | R2 | R3 | R4 | R1 | R2 | R3 | R4 |
| T1 | 1 | 1 | 0 | 0 | Accuracy in offers and more conversion | Automated churn models for more churn management | – | – |
| T2 | 0 | 0 | 1 | 1 | – | – | Top management takes decision with focus on customer satisfaction | Decision are focused with revenue enhancement opportunities |
| T3 | 1 | 1 | 0 | 0 | Better quality output of offers | More effective churn management | – | – |
| T4 | 1 | 0 | 1 | 1 | Increased ability to react to market situation | – | Proactive management of customer expectations | Ability to protect revenues |
| T5 | 1 | 1 | 1 | 1 | Comparison of trends of offers | Comparison of churn models | Customer requirement understanding | Benchmarking company results with other operators |
| T6 | 1 | 1 | 0 | 0 | Effective team | Knowledgeable team | – | – |

**Table IX.** Binary and interpretive matrix between activities and performance

to processes interprets the role of the different actors in the strategic processes. The results of this study clearly show that the role of the top management in dominating most of the processes is fairly significant and ranks the top most. This way it helps clarify the dominating roles played by the various actors basis which a TSP can develop an actor centred approach for improving the effectiveness of these processes.

| ↓[a] | Dominating→ A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 |
|---|---|---|---|---|---|---|---|---|
| A1 | – | P1, P2, P3, P4 | P1, P3, P4 | P1, P2, P3, P4 | P2, P3, P4 | P1, P2, P3, P4 | P1, P3 | P2, P3 |
| A2 | P2 | – | P1, P2, P3, P4 | P1, P2 | – | P1, P2 | P4 | – |
| A3 | P2 | P1, P2 | – | P1, P2 | P2 | P2 | P1, P2 | – |
| A4 | P2 | P1, P2, P3 | P1, P2, P4 | – | P2, P3, P4 | P2, P3, P4 | P2, P3 | P2, P3 |
| A5 | P1, P2, P3, P4 | – | – | P2, P3, P4 | – | P2, P3, P4 | P1, P2 | P1, P2 |
| A6 | P2, P3 | – | – | P2, P3, P4 | P1, P2, P3, P4 | – | P2, P3, P4 | P2, P3, P4 |
| A7 | P1, P2, P3 | P4 | – | P3, P4 | – | – | – | P4 |
| A8 | P1, P2, P3 | P3, P4 | – | P2, P3, P4 | – | P2, P3, P4 | – | – |

**Note:** [a]Variables being dominated

**Table X.** Dominating interaction matrix – ranking of actors w.r.t process

| | A1 | A2 | A3 | A4 | A5 | A6 | A7 | A8 | Dominating (D) | Net (D-B) | Rank dominating |
|---|---|---|---|---|---|---|---|---|---|---|---|
| A1 | – | 4 | 3 | 4 | 3 | 4 | 2 | 2 | 22 | 7 | I |
| A2 | 1 | – | 4 | 2 | – | 2 | 1 | – | 10 | −2 | VII |
| A3 | 1 | 2 | – | 2 | 2 | 1 | 2 | – | 10 | 0 | IV |
| A4 | 1 | 3 | 3 | – | 3 | 3 | 2 | 2 | 17 | −2 | VI |
| A5 | 4 | – | – | 3 | – | 3 | 2 | 2 | 14 | 2 | II |
| A6 | 2 | – | – | 3 | 4 | – | 3 | 3 | 15 | −1 | V |
| A7 | 3 | 1 | – | 2 | – | – | – | 1 | 7 | −5 | VIII |
| A8 | 3 | 2 | – | 3 | – | 3 | – | – | 11 | 1 | III |
| B[a] | 15 | 12 | 10 | 19 | 12 | 16 | 12 | 10 | 106/106 | | |

**Note:** [a]Number of cases being dominated

**Table XI.** Dominance matrix – ranking actors w.r.t. processes

| | T1 | T2 | T3 | T4 | T5 | T6 |
|---|---|---|---|---|---|---|
| T1 | – | R1, R2, R3, R4 | R1, R2 | R1, R2, R4 | R1, R2 | R1, R2 |
| T2 | R1, R2, R3, R4 | – | R3, R4 | R3, R4 | R1, R2, R3, R4 | – |
| T3 | R1, R2 | R3, R4 | – | R3 | – | – |
| T4 | R1, R2 | R3, R4 | R1, R3 | – | R1, R4 | R4 |
| T5 | R1, R2, R3, R4 | – | R1, R2 | R1, R2 | – | R1, R2 |
| T6 | R4 | R1, R2 | – | R3, R4 | R3, R4 | – |

**Table XII.** Dominating interactions matrix – ranking of actions w.r.t. performance

| | T1 | T2 | T3 | T4 | T5 | T6 | Dominating (D) | Net (D-B) | Rank dominating |
|---|---|---|---|---|---|---|---|---|---|
| T1 | – | 4 | 2 | 3 | 2 | 2 | 13 | 0 | III |
| T2 | 4 | – | 2 | 2 | 2 | 4 | 14 | 4 | I |
| T3 | 2 | 2 | – | 1 | – | – | 5 | −3 | VI |
| T4 | 2 | 2 | 2 | – | 2 | 1 | 9 | −1 | IV |
| T5 | 4 | – | 2 | 2 | – | 2 | 10 | 3 | II |
| T6 | 1 | 2 | – | 2 | 2 | – | 7 | −2 | V |
| B[a] | 13 | 10 | 8 | 10 | 8 | 9 | 58/58 | | |

**Table XIII.** Dominance matrix – ranking actions w.r.t. performance

Similarly the ranking of the actions w.r.t to the performance interprets the influence of the key actions that need to be taken to have the maximum impact on the performance. Again this model verifies that the steering board run by the top management for the implementation and ongoing running of the BI practice has to be very effective and take prompt decisions for the success of this programme. Monitoring the KPIs that are developed using the BA tools and used by the business managers is the next action that needs to be prioritised.

## 6. Research synthesis

The topic of adoption of BA practice in a TSP can be synthesised using the thematic analysis or qualitative research synthesis. This topic is very relevant in today's world of fast growing telecom industry. The use of a case study within the SAP-LAP framework provides the background to study the barriers and enablers of adoption of BA practice. This research methodology can be extended beyond the telecom industry. The IRP method helps in creating a quantitative interpretation of the prioritisation required to manage the identified risks for the adoption of the BA practice. Literature review and the secondary research done to study this area provide enough evidence towards the need for this type of study.

Synthesising research based on qualitative inputs is always a matter of debate and leaves room for further research. The selection of the case study based on a real life example in the Indian telecom market is a good starting point to research the area of implementing a mature competency centre for BA when it has become very clear that analytics will be the foundation to forthcoming decisions that telcos will take worldwide. The research was broken up into four areas – evolution of BA, implementation of successful IT projects, models used to study the risks of implementation of a process, system or centre and case study methodology. These four areas were synthesised to conduct the research and study the various risk factors for implementing a successful competency centre in BA in a emerging market TSP.

The results of the IRP models have been explained in the next section: "Theory and Practice" and subsequently the conclusions section gives the limitations of the current research and opportunity areas for further research.

## 7. Theory and practice

Tables XI and XIII presents the results of the dominance matrices of the actors w.r.t processes and actions w.r.t. performance, respectively. These matrices are a select part of the research that can be used by managers in a TSP to take prioritised decisions in which to mitigate the risks.

On analysing the results in Tables XI and XIII from the IRP modelling, it is clear that the top management (actors) and their support through regular attendance in the steering committees (actions) are the most critical aspects for a successful implementation of the BA competency set up. In the order of dominance the other actors of significance that would impact the successful implementation are the competition, customers consuming the offers and the system integrators. These dominances are re-established in the second dominance matrix of actions w.r.t performance also. Beyond the top management sponsorship, the actions of monitoring process effectiveness through KPIs and performance tracking, proactive and reactive actions for internal tool implementation and external technology changes and gathering intelligence of competition and other external factors.

The strong correlation between actors w.r.t to process and action w.r.t performance are validated in this research.

The theoretical implications for such a study are that the SAP-LAP framework enables the researcher to analyse the various situations, actors, processes, learning actions and performances with regards to the establishing the competency centre for BA in a TSP. The binary and interpretive matrix along with the dominating interaction matrix in the IRP modelling helps in establishing the dominance matrix between actors w.r.t processes and actions w.r.t processes and therefore arrive at the prioritisation of the factors that need to be considered during the implementation.

In practice, this research study proposes the use of the SAP-LAP framework for the risk mitigation strategies to help the TSP organisation to build a comprehensive understanding of managing a BA competency centre thus increase the adoption of BA practice. Since this concept of creating a "competency centre" or "centre of excellence" is still quite a recent development in most service providers, research of this type will help the organisation to pin-point and build mitigating strategies around the risks of such initiatives. The amount of investment that is required to build such a competency centre justifies the need to do a study and have concrete strategies to mitigate the risks.

While a number of risk mitigating proactive and reactive strategies have been identified and discussed in this paper, most organisations cannot afford to implement all to the fullest. Depending on the dominance matrix and a good understanding of the shortcomings of the strategies, top management of each TSP will need to make decisions on the critical and essentials ones that need to get implemented initially. The other risks then need to be monitored on a regular basis.

The SAP-LAP framework demonstrates to the managers the importance of involvement of the various actors in the process and situations which would have an impact on the results by having appropriate actions through learnings.

The application of the IRP enables the organisation to better understand the linkages of the various variables of the SAP-LAP based model and therefore helps the managers take informed decisions. The SAP-LAP based model identified the risks but the IRP model will actually help the managers to decide on the areas that will have maximum impact in effectively implementing the BA practice. Table X ranks the actors that play crucial role in the entire process of implementing the BA practice. Clearly, the three most important actors are the top management, competition and customers. Table XIII results show that the top three actions that will help in maximising the performance of the BA practice are top management sponsorship, monitoring the process effectiveness through KPIs and keeping track of the tools that are required enhance the capabilities of the competency centre.

## 8. Conclusion

This paper tries to develop a flexible framework to evaluate the risk mitigation strategies while adopting BA practice in a TSP using the SAP-LAP and IRP models. The SAP-LAP model of inquiry used in this study helps in teasing out the right situations, actors, process and synthesise them with the learning, actions and performance. Today the relevance of implementing the most advanced tools in BA like big data, visualisation tools, what-if analysis model, social media feedback, etc. is well understood by TSPs especially in the emerging markets where the volume, velocity and variability of the data is a challenge to keep pace with. With the roll out of data services like 3G and LTE/4G this initiative has become all the more important.

This study is based on the understanding that it is also understood by the TSPs that only implementing expensive IT tools will not bring the desired results of enhancing the revenues or customer satisfaction. The key lies in implementing a competency centre that has the people and business actions defined to make the tools more effective.

Since the concept of such a centre is relatively new, there are risks that need to be identified and dealt with. The management process mainly is concerned with the prioritisation and selection of the risk mitigation strategies. Without the use of a well-researched model it would remain at best a rational experience-based process and at worst a gut-feel or intuitive judgement. According to the proposed SAP-LAP, the standpoint of the actors in the various situations and processes should be considered in building the risk mitigation strategies.

This research has been based on the case study of an emerging market TSP and therefore could have the limitation of the data sets and market environmental factors. The risk factors could be different for a telecom provider in a mature market or even in emerging markets the difference in size of a telecom operator could bring in different risk elements. Therefore there is an opportunity to extend the research using more data sets to validate the framework suggested in this paper. The research provides a lot of future opportunities for further research in this area, e.g.:

- There could also be an impact of one a situation with another, or one actor with another. This could be studied further though a self-interaction matrix. Then the impact of self-interaction and cross-interaction could also be studied and the risk mitigation strategy prioritisation could be refined further.
- A case study approach has helped understanding the variables from one large TSP in the emerging market scenario. This study could be extended to the mature European markets to see the relevance of the risk mitigation strategies since the implementation of BA is also very relevant in those markets.
- Researching the CSFs in implementing the competency centre for BA would strengthen the findings of this paper

## References

Bose, R. (2009), "Advanced analytics: opportunities and challenges", *Industrial Management & Data Systems*, Vol. 109 No. 2, pp. 155-172.

Casado, E. and Raisinghani, M. (Eds) (2004), *Expanding Business Intelligence Power with System Dynamics in Business Intelligence in the Digital Economy: Opportunities, Limitations and Risks*, Idea Group Publishing, Hershey, PA.

Cavalcanti, E.P. (2005), "The relationship between business intelligence and business success", *Journal of Competitive Intelligence and Management*, Vol. 3 No. 1, pp. 6-15.

Elbashir, M.Z., Collier, P.A. and Davern, M.J. (2008), "Measuring the effects of business intelligence systems: the relationship between business process and organizational performance", *International Journal of Accounting Information Systems*, Vol. 9 No. 3, pp. 135-153.

Fayyad, U.M., Piatetsky-Shapiro, G., Smyth, P. and Uthurusamy, R. (Eds) (1996), *Advances in Knowledge Discovery and Data Mining*, ISBN 978-0-262-56097-9, AAAI/MIT Press, Cambridge, MA and London.

Ganesh, J., Arnold, M. and Reynolds, K. (2000), "Understanding the customer base of service providers: an examination of the differences between switchers and stayers", *Journal of Marketing*, Vol. 64 No. 3, pp. 65-87.

Haleem, A.S., Qadari, M.A. and Kumar, S. (2012), "Analysis of critical success factors of world class manufacturing practices: an application of interpretivestructural modelling and interpretive ranking process", *Production Planning and Control*, Vol. 23 Nos 10-11, pp. 722-734.

Irani, Z., Ezingeard, J.N. and Grieve, R.J. (1997), "Integrating the costs of an IT/IS infrastructure into the investment decision making process", *The International Journal of Technological Innovation, Entrepreneurship and Technology Management (Technovation)*, Vol. 17 Nos 11-12, pp. 695-706.

Ishaya, T. and Folarin, M. (2012), *Business Intelligence in Telecoms Industry: A Service Oriented Approach*, INTECH Open Access Publisher.

Isik, Ö., Jones, M.C. and Sidorova, A. (2012), "Business intelligence (BI) success and the role of BI capabilities", *Intelligent Systems in Accounting, Finance and Management*, Vol. 18 No. 4, pp. 161-176.

Isık, Ö., Jones, M.C. and Sidorova, A. (2013), "Business intelligence success: the roles of BI capabilities and decision environments", *Information & Management*, Vol. 50 No. 1, pp. 13-23.

Kohavi, R., Rothleder, N.J. and Simoudis, E. (2002), "Emerging trends in business analytics", *Communications of the ACM*, Vol. 42 No. 8, pp. 45-48.

Laursen, G. and Thorlund, J. (2010), *Business Analytics for Managers: Taking Business Intelligence Beyond Reporting*, John Wiley & Sons, Inc, Hoboken, NJ.

Lima, E., Mues, C. and Baesens, B. (2009), "Domain knowledge integration in data mining using decision tables: case studies in churn prediction", *Journal of the Operational Research Society*, Vol. 60 No. 8, pp. 1096-1106.

Mangla, S.K., Kumar, P. and Barua, M.K. (2014), "A flexible decision framework for building risk mitigation strategies in green supply chain using SAP-LAP and IRP approaches", *Global Journal of Flexible Systems Management*, Vol. 15 No. 3, pp. 203-218.

Manglik, A. and Mehra, V. (2005), "Extending enterprise BI capabilities: new patterns for data integration", *Business Intelligence Journal*, Vol. 10 No. 1, pp. 10-17.

Mingwei, S. and Guangxing, C. (2009), "The construction of comprehensive evaluation model of business intelligence system", *Journal of Tonghua Teachers College*, Vol. 30 No. 10, pp. 46-49.

Moss, L. and Atre, S. (2003), *Business Intelligence Roadmap: The Complete Project Lifecycle for Decision-Support Applications*, Addison-Wesley, Boston, MA.

Pramod, V.R. and Banwet, D.K. (2010), "Systems modelling of telecom sector supply chain: a SAP-LAP analysis", *International Journal of Business Excellence*, Vol. 3 No. 1, pp. 38-64.

Saaty, T.L. (1980), *The Analytic Hierarchy Process*, McGraw-Hill Book Co, New York, NY.

Stake, R.E. (1995), *The Art of Case Study Research*, Sage, Thousand Oaks, CA.

Sushil (1997), "Flexible systems management: an evolving paradigm", *Systems Research and Behavioral Science*, Vol. 14 No. 4, pp. 259-275.

Sushil (2000a), "Situation-actor-process options: mapping and enhancing flexibility", *Systems Research and Behavioral Science*, Vol. 17 No. 3, pp. 301-309.

Sushil (2001a), "SAP–LAP framework", *Global Journal of Flexible Systems Management*, Vol. 2 No. 1, pp. 51-59.

Sushil (2009), "Interpretive ranking process", *Global Journal of Flexible Systems Management*, Vol. 10 No. 4, pp. 1-10.

Telecom Regulatory Authority of India (2014a), "Report on: the Indian telecom services performance indicators for quarter ending", March, available at: www.trai.gov.in (accessed 10 August 2014).

Telecom Regulatory Authority of India (2014b), "The Indian telecom services performance indicators", July.

Warfield, J.W. (1974), "Developing interconnected matrices in structural modelling", *IEEE Transcript on Systems, Men and Cybernetics*, Vol. 4 No. 1, pp. 51-81.

Watson, H.J., Abraham, D., Chen, D., Preston, D. and Thomas, D. (2004), "Data warehousing ROI: justifying and assessing a data warehouse", *Business Intelligence Journal*, Vol 2 No. 9, pp. 6-17.

Weiss, G. (2008), "Data mining in the telecommunications industry", in Wang, J. (Ed.), *Encyclopedia of Data Warehousing and Mining*, Vol. 1, 2nd ed., Information Science Publishing, pp. 486-491.

Yeoh, W. and Koronios, A. (2010), "Critical success factors for business intelligence systems", *Journal of Computer Information Systems*, Vol. 50 No. 3, pp. 23-32.

Yeoh, W., Koronios, A. and Gao, J. (2008), "Managing the implementation of business intelligence systems: a critical success factors framework", *International Journal of Enterprise Information Systems*, Vol. 4 No. 3, pp. 79-94.

Yin, R.K. (1984/1994), *Case Study Research: Design and Methods*, Sage Publications, Thousand Oaks, CA, London and New Delhi.

## Further reading

Baaras, H. and Kemper, H.G. (2008), "Management support with structured and unstructured data – an inte-grated business intelligence framework", *Information Systems Management*, Vol. 25 No. 2, pp. 132-148.

Banker, R.D., Kaufmann, R.J. and Mahmood, M.A. (2012), *Strategic Information Technology Management: Perspectives on Organizational Growth and Competitive Advantage*, Idea Group Publishing, pp. 359-374.

Bernstein, P.A. and Haas, L.M. (2008), "Information integration in the enterprise", *Communications of the ACM*, Vol. 51 No. 9, pp. 72-79.

Chaudhuri, S., Dayal, U. and Narasayya, V. (2011), "An overview of business intelligence technology", *Communications of the ACM*, Vol. 54 No. 8, pp. 88-98.

Clarke, R. and Libarikian, A., McKinsey & Company (2014), "Building an advanced-analytics center of excellence", available at: www.information-management.com/news/building-an-advanced-analytics-center-of-excellence-10026012-1.html (accessed 15 August 2014).

Delone, W.H. and McLean, E.R. (1992), "Information systems success: the quest for the independent variable", *Information Systems Research*, Vol. 3 No. 10, pp. 60-95.

Eckerson, W.W. (2003), "Smart companies in the 21st century: the secrets of creating successful business intelligence solutions", TDWI Report Series, pp. 1-38.

Glancy, F.H. and Yadav, S.B. (2011), "Business intelligence conceptual model", *International Journal of Business Intelligence Research*, Vol. 2 No. 2, pp. 48-66.

Hwang, M. and Xu, H. (2008), "A structural model of data warehousing success", *Journal of Computer Information Systems*, Vol. 2 No. 9, pp. 48-56.

Kumar, P. (2012), "Impact of business intelligence systems in Indian telecom", *Business Inteeligence Journal*, Vol. 5 No. 2, pp. 258-366.

Olszak, C.M. and Ziemba, E. (2006), "Business intelligence systems in the holistic infrastructure development supporting decision-making in organizations", *Interdisciplinary Journal of Information, Knowledge and Management*, Vol. 1 No. 1, pp. 47-58.

Ranjan, J. (2008), "Implementing business intellingence in Indian firms: prospects and challenges", *International Journal of Indian Culture and Business Management*, Vol. 1 No. 3, pp. 277-295.

Redman, T.C. (1998), "The impact of poor data quality on the typical enterprise", *Communications of the ACM*, Vol. 41 No. 2, pp. 79-82.

Sushil (2000b), *Cornerstones of Enterprise Flexibility: Strategic, Organizational, Financial, Information Systems and Manufacturing Flexibilities*, Global Institute of Flexible Systems Management, Vikas Publishing House, New Delhi.

Sushil (2000c), "SAP-LAP models of inquiry", *Management Decision*, Vol. 38 No. 5, pp. 347-353.

Sushil (2001b), "SAP-LAP models", *Global Journal of Flexible Systems Management*, Vol. 2 No. 2, pp. 55-61.

Telecom Regulatory Authority of India (2009), "TRAI issues Telecommunication Mobile Number Portability Regulations" Press Release No. 68/2009, available at: www.trai.gov.in (accessed 10 August 2014).

Trkman, P., McCormack, K., Valadares de Oliveira, M.P. and Ladeira, M.B. (2010), "The impact of business analytics on supply chain performance", *Decision Support Systems*, Vol. 49 No. 3, pp. 318-327.

Watson, H.J. and Wixom, B. (2007), "The current state of business intelligence", *IEEE Computer*, Vol. 40 No. 9, pp. 96-99.

**Corresponding author**
Amrita Gangotra can be contacted at: agangotra@yahoo.com