Chapter 2
New Approaches in Supporting to SMEs Competitiveness

Considering the presented limitations of SMEs, it is obvious that they require support to improve their competitiveness. The Comarch company has given a very accurate response to the question of what would such enterprises need to compete against bigger companies[1] raised at a conference organised for IT producers and suppliers in 2008 (Rostek 2010): '*The same things as large companies, only better, quicker and cheaper*.'

Watching the operation of big and highly competitive companies, we may notice that the power derived from cooperation (Czakon et al. 2014) and mutual trust (Paliszkiewicz and Koohang 2013) is becoming more and more appreciated. These are the grounds for communities that follow the principle of 'paying it forward' (Jones-Kaminski 2009). This principle is to be understood as selfless aid to all those in need in the hope that this aid will return to the donor in an appropriate moment. In effect, this principle contributes to the enhancement of the entire community that follows it. Consortia (Daddi et al. 2012), clusters (Ketels 2011) and strategic networks (Czakon and Klimas 2014) base their might on such foundations.

Cooperation based on trust also create conditions for learning from one another through the application of developed and verified patterns (Rostek 2013b, 2014). Benchmarking defined this way will serve the entire collaborating community and contribute to enhancing its competitiveness. The effectiveness of collaboration in the field of patterns and analyses should be supported by specialised IT technologies such as Business Intelligence (BI) (Akram 2011) or other types of advanced systems of analysis and data reporting (Lai et al. 2011).

The present chapter discusses the aforementioned concepts and related methods and tools. Section 2.1 presents relevant approaches to competitive collaboration, which transforms competitive fight into competitive cooperation, bringing benefits to all stakeholders. In this approach individual entities do not give up on their

[1] Comarch—a global powerhouse specialized in the design, implementation and integration of advanced IT services and software (http://www.comarch.co.uk/).

K. Rostek, *Benchmarking Collaborative Networks*, Contributions to Management Science, DOI 10.1007/978-3-319-16736-7_2

identity, focus on the achievement of own goals, and run their business in harmony and not in opposition to others. Therefore, various forms of learning from one another are possible with the use of patterns that have been proven and verified by others. This process is supported by the benchmarking method characterised in Sect. 2.2.

Nevertheless, it is also possible to imagine a situation in which a collaborating group established to reinforce its competitiveness does not have enough knowledge and skills even as a sum of entities. A solution to this problem may be information and knowledge brokering presented in Sect. 2.3. It allows for using external knowledge and information reserves to support the achievement of own goals and objectives. Naturally, all of that requires relevant technological support, which is provided by the BI technology described in Sect. 2.4.

The said approach to competition is closely related to the need to trust competitors and business partners because without trust no cooperation is possible. Trust creates the foundations of collaboration and mutual understanding, but may also pose a threat to an entity that does not analyse and rationalise its decisions in this respect. Therefore, Sect. 2.5 presents the basic principles to be followed by an organisation in trust and risk management.

The aforementioned elements are summarised in the BCN concept drafted in Sect. 2.6. Its detailed characteristic is the subject of all the remaining chapters of the present book.

2.1 Collaboration and Coopetition

In strategic management, the paradigm of competition, which interprets it as rivalry between companies (Porter 1985, 1998), is based on constant striving for individual profits (Xavier and Ramachander 2000). The survival of an organisation is in this case determined by measures that reinforce its competitiveness and focus on the creation of individual competitive advantage (Gilpin 2000). Taking into consideration the instability of markets and considerable changes in the economy, aggressive behaviour in line with the rule ‘the winner takes it all’ predominates in this approach (D’Aveni 1994).

A totally different view on the relations between organisations that ensures their survival on the market prevails in the cooperative perspective. In view of globalisation, intensifying competition and the need to keep up with technological development, cooperation enables business entities to reinforce their own competitive potential. Appropriate use of this potential will translate into effectiveness of the conducted business activity. Therefore, in spite of a natural inclination of companies to compete, numerous forms of cooperation may also be observed (Danik and Lewandowska 2013), which lead to a search for consensus that will bring profit to all parties and not eliminate any of them.

In accordance with the paradigm of cooperation, companies are ordered through the networks of developing interrelations and supported by strategic cooperation

(Thomas and Pollock 1999). Emphasis on the development of cooperation results from the belief that organisations may improve their performance this way. This is possible owing to the fusion of resources, skills and competences, and sometimes even infrastructure. Competitive advantage is achieved through strategic alliances and networks of cooperation (Sroka and Hittmár 2013).

Cooperation between companies defined this way may be viewed from the perspective of horizontal and vertical relations. Vertical cooperation is a natural process because it proceeds along the production—distribution—sale chain between the supplier—producer—distributor—client. This form of cooperation leads to enhancing the innovative potential of participating companies, transfer of knowledge between related entities and above all to a better adaptation to client's needs and expectations, also in terms of the opportunity to shape them. Horizontal cooperation in turn relates above all to enterprises and organisations which traditionally remain market competitors. It is the horizontal interaction that combines two extreme approaches—competitiveness and cooperation.

The concept of competitive collaboration was introduced to management sciences in 1996 by Brandenburger and Nalebuff (Brandenburger and Nalebuff 1996). It is referred to as coopetition, and means simultaneous competition and cooperation between market competitors. Coopetition means that entities are competing and cooperating in a repeatable way, although they remain organisationally separate. Firms can integrate their activities so as to achieve planned mutual benefits, while at the same time acting as rivals in order to pursue their own individual strategic goals (Zakrzewska-Bielawska 2013).

The theoretical basis for coopetition can be found in the game theory (Okura 2007), the theory of transaction costs (Lacoste 2012), the resource based view (Zakrzewska-Bielawska 2013), the theory of social capital (Inkpen and Tsang 2005), and interorganisational dynamics (Tidstrom 2008). By analysing coopetition it is possible to list the main advantages and benefits that a organization may derive from such a strategy as follows (Bigliardi et al. 2011):

- synergistic effect—cooperating companies achieve synergy owing to the exchange of experience and knowledge in the field of management, entrepreneurship, innovativeness, organisational culture, know-how, organisation of manufacturing processes or networks and channels of distribution;
- specialization—coopetition models facilitate access to modern management methods and techniques, marketing capacities, specialist technologies, patents and trademarks;
- advantages of scale—increasing the organisational, economic and technological potential favours achieving market advantage, which may be used to decrease costs or introduce special offers;
- risk reduction—creating networks of cooperation leads to diversifying resources and markets and lowers the risk of the conducted business activity, which in itself often persuades companies to undertake coopetitive measures.

Consequently, different coopetitive solutions involve different proportions of competitiveness and cooperation, as well as resulting benefits. With regard to the

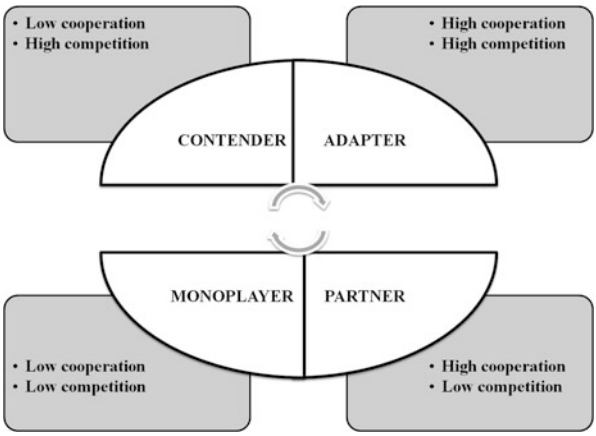

Fig. 2.1 The four partial coopetition model [*source*: (Luo 2004)]

presence of these two factors (competitiveness and cooperation) and their interrelations, the following coopetitive behaviours may be identified ((Luo 2004), Fig. 2.1):

- monoplayer—behaviours that favour individual measures yet are devoid of aggressive competition;
- partner—behaviours that favour teamwork, devoid of aggressive competition;
- adapter—behaviours that favour teamwork but do not reject competitive rivalry;
- contender—behaviours that favour individual measures aimed at competitive rivalry.

The selection of one of these models will depend on three factors that determine the sustainability of cooperation, namely: strategy, culture and organisation, defined as follows (Child et al. 2005):

- a strategic adaptation—in order to clearly identifiable a source of sustainable competitive advantages and develop an increasing level of interdependence;
- a cultural adaptation—in order to provide the right basis for cooperation and a common growth;
- an organizational arrangements—in order to identify the best form of coopetition, to clearly define the responsibilities of each partner and to provide the right mechanisms in order to solve conflicts.

The importance of coopetition seems to be even greater in the context of SMEs. The SMEs need to collaborate with their competitors to be able to create economies of scale, mitigate risk, and leverage resources (Morris et al. 2007). Thanks to coopetition the competitors can to face similar challenges more effective, because possess resources and capabilities that are directly relevant to each other (Gnyawali and Park 2009). It results as consequence, that SMEs could more effectively compete against large players, what has positive impact on their financial performance (Levy et al. 2003). In the Benchmarking Collaborative Network,

cooperation between SMEs has been used to create a Benchmarking Collaborative Group, which is described in Chap. 4 *Arranging Benchmarking Collaborative Group*.

2.2 Benchmarking

As shown in the previous sub-chapter, cooperation between SMEs is advisable, and sometimes even crucial, especially if an enterprise strives for long-term and sustainable development. Yet it is also important to determine the scope of cooperation, which should focus on knowledge and experience exchange (Levy et al. 2003), and using the patterns developed by the leaders of the created cooperative groups (Zeng et al. 2010). In effect, this will enable enterprises to develop more effective competitive strategies with more foreseeable results.

The effectiveness of the prepared competitiveness strategy depends on knowledge of the competitive factors and the ability to predict the actions taken by the competitors (Trkman et al. 2010). The source of the necessary knowledge in this area is undoubtedly the experience and skills of managers, which should be supported by information obtained as a result of the pursued competitive analysis. As confirmed by conducted research (Crouch 2011), those economic entities that take into account the results of the competitive analysis and the existing (market and non-market) constraints have the biggest chance of successful entry and effective activities on the market.

The achieved competitive position, understood as a result of the implemented competitive strategy, is constrained not only by business capabilities, but also by the parallel activities carried out by market competitors. So the wider information regarding the operation of the business and its environment, the greater the effectiveness of the prepared strategy for competitiveness. The competitive analysis usually refers to its own results, but expanded to benchmarking, i.e. the process of comparison analysis in many areas of business with other competitors will increase the management efficiency of the competitiveness development strategy (Huggins 2010). An opportunity is the organization of a collaboration group focusing on the use of benchmarking analysis methods.

Benchmarking is an external view of internal activities, functions or operations in order to achieve continuous improvement (Ahmed and Rafi 1998). The essence of benchmarking is the process of identifying the highest standards of excellence for products, services, or processes, and then making the improvements necessary to reach those standards, commonly called best practices (Elmuti and Kathawala 1997). These elements may be compared within an organization or with partners outside the organisation (Ajelabi and Tang 2010). The classification of benchmarking reflect what is compared (i.e. object of comparison, Fig. 2.2) and by what the comparison is being made (i.e. scope of comparison, Fig. 2.2).

The first one involves comparisons of performance, process and strategic benchmarking. Performance benchmarking is the comparison of performance

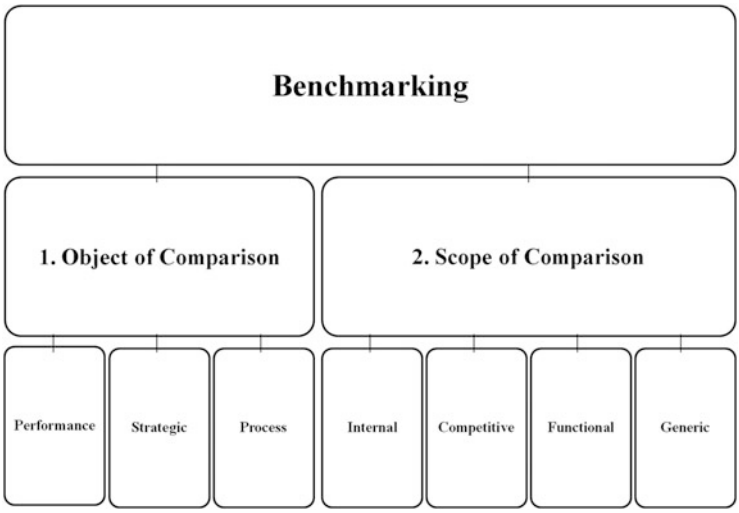

Fig. 2.2 The classification of benchmarking types (*source*: own research)

measures for the purpose of determining how good an organization is in comparison to the others. Process benchmarking compares methods and processes in an effort to improve the processes within an organization. Strategic benchmarking is the comparison of an organisation's strategy with successful strategies from other organizations to help improve capability to deal with a changing external environment.

The second one includes internal, competitive, functional and generic comparisons. Internal benchmarking is the comparisons of performance made between department/divisions of the same organization solely to find and apply best practice information. Competitive benchmarking compares made against the leader in the same market to compare performance and results. Functional benchmarking is comparisons of a particular function in an industry to become the best in this function. Generic benchmarking is the comparison of processes against best process operators regardless of industry.

Due to the presented broad range of applications, benchmarking makes use of various methods of implementation. Yet each of them has to include features that will enable the achievement of the main objective of benchmarking, which is the improvement of efficiency, productivity and/or quality owing to the use of proved patterns, developed and verified by group or market leaders. These features include (Khetrapal and Thakur 2014):

– reliability and credibility of the developed ranking lists and comparisons. All ranking lists have to be accompanied by a detailed method of their development and the obtained results of statistics, which will allow for evaluating and verifying the correctness of the procedure;
– transparency and verifiability of the applied analytical methods, calculations and assumed measurement error. The results of conducted analyses will form

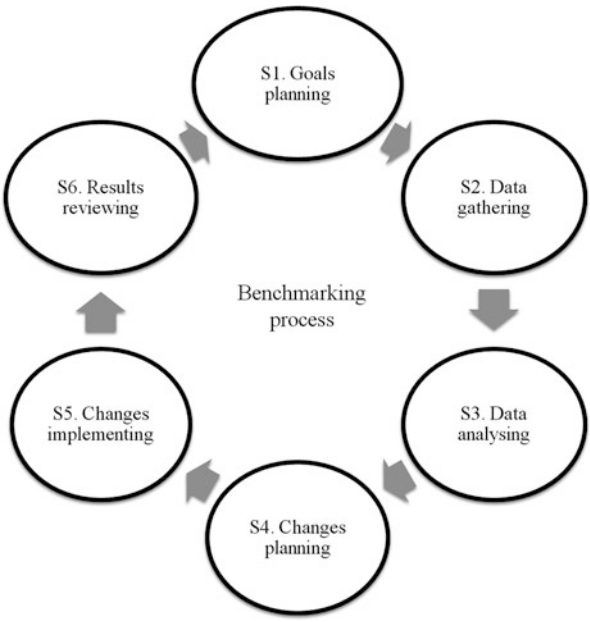

Fig. 2.3 The benchmarking cycle process (*source*: own research)

grounds for the ranking lists; therefore, their publication contributes to increasing the creditworthiness of the final outcomes;
- reduction of requirements and obligations resulting from participation in a benchmarking group to those that are really justified and determine the achievement of expected results. Excessive and unjustified requirements may cause reluctance and mistrust of possible group members and limit their number;
- adaptability to various applications and types of compared entities, which allows for generalising the method's applicability and its results;
- compliance with the standards of the economic theory and the use of the most recent developments in economic studies.

Having regard to the above benchmarking appears as a cyclical process comprising six stages shown in Fig. 2.3:

- Stage 1—planning and setting scope, goals and measures of goals in the benchmarking process;
- Stage 2—gathering the adequate data and information for benchmarking analysis;
- Stage 3—analyzing the data, validating and verifying the results;
- Stage 4—planning the changes based on the verified analysis results;
- Stage 5—executing and implementing the defined changes;
- Stage 6—reviewing results, assessing the degree of goals achievement and the need for input to the next process iteration.

Cyclicality of this process is that it doesn't finish after stage 6, but most often returns to the planning phase for the next iteration. Thanks to this the whole process still being subject to improvement and the company achieves next defined goals.

As this stems from Fig. 2.3 benchmarking is performed by analyzing the collected data, so can be considered as a new method of analysis. The adoption of benchmarking as a method for competitive analysis (Raharjo et al. 2010) has resulted in the widening of the scope of its use. The most popular form of benchmarking is an analytical service performed in a defined area of management by the consulting and services companies (for example IBM,[2] Cartesian[3]), which have the data from a specific management area. The strengths of such a service are the high competences of service staff and access to a wide range of necessary data. The drawback, however, is its one-off nature, which is sufficient in the case of projects and undertakings, but becomes a constraint in the case of repetitive actions, such as the continuous projection and implementation of strategies.

There have been attempts to build and disseminate multi-user solutions in the field of benchmarking analysis (Sapio et al. 2007). The strength of these solutions is their durability, openness and accessibility. The drawback, however, is that there are problems with the maintenance, development and flexibility of solutions, upgrades to processing data, and also the interpretation and utility of available results. Hence the new research trend—the knowledge-based benchmarking systems (Lai et al. 2011)—which in a clear, accessible and useful way supports decision-making and the creation of business strategy. The ability to use these solutions entails the need to implement advanced IT technologies such as BI (Completo et al. 2012).

Benchmarking, used as a method of competitive analysis, increases the possibility of traditional analysis, because it not only measures the effects of the strategy, but also identifies causes and points to the possibility of their improvement. Therefore modern benchmarking methods such as the European Benchmarking Procedure (European Commission 2012; Maggetti and Gilardi 2011) or clusters benchmarking (Ketels et al. 2012; Park et al. 2012) show how effectively benchmarking can be used to support a competitive strategy.

In the European Union, benchmarking has become a key instrument in the Open Method of Coordination, supporting the achievement of the competitive advantage in member states in terms of both economic and social objectives (Bruno 2009; European Commission 2012). The method is based on mutual learning through the identification and transfer of best practices at different levels of economy management (i.e. sectoral, national and transnational). On this basis, new benchmarking methodologies are created, taking into account the scope, principles and conditions for their implementation (Dévai et al. 2002; Lilama 2010).

[2] http://www-03.ibm.com/systems/services/benchmarkcenter/, date of reading 23-07-2013.

[3] http://www.cartesian.com/technology/technical-services-and-consulting/it-benchmarking, date of reading 23-07-2013.

Also, the benchmarking of clusters, led by the ESCA (*European Secretariat for Cluster Analysis*), is found widely used in the European Union. The ESCA has registered 190 clusters and is currently providing the results of a comparative study in the area of organizational structures, processes, products and services (ESCA 2012). They also make comparisons on a smaller scale, for example for clusters operating in a specific industry (ABC-Network 2007; Inovisa 2012).

The advantage of the presented methods is a wide range of available comparisons and supporting the process of the European institutions. The limitations are the need to involve significant resources and incurring high investment outlays, which require the involvement of government institutions (the European Benchmarking Procedure) or a larger group of cooperating and competing entities (the benchmarking of clusters).

In this context, one can see the need for such an implementation of a benchmarking method, which will be more accessible and flexible for SMEs, which function primarily in the local market, have only a little knowledge and experience in the field of European cooperation and remain outside the existing clusters. The proposed solution is the Collaborative Benchmarking Method, presented in Chap. 4—*Arranging Collaborative Benchmarking Group*.

2.3 Brokering and Crowdsourcing

A significant limitation of SMEs is the lack of knowledge, experience and skills in the proper synthesizing of strategic information. Even if the SMEs collaboration was taken, it will be necessary for the support of a specialist entity in the range of coordinating the activities of SMEs group and being responsible for the quality of provided information. The information broker is such an entity.

The Information broker is a person or a company which provides (for a fee) organised and coordinated access to heterogeneous—structured and semi-structured information sources (Martin et al. 1997). There are four categories of competences information broker needs to master (Denchev and Christozov 2012):

- searching for data and information—to survey, scan and search the heterogeneous sources by exploring all of the components of information environment;
- storing data—to collect and store the obtained information and data;
- analysing of data—to analyse data and information, to visualise results and to send them in a form suitable for the user;
- presenting results—to present matched and analysed results in a suitable and understandable form.

Based on the above requirements the process of information brokering can be established (Christozov and Toleva-Stoimenova 2014):

- selection of the information environment—identifying relevant to the problem domain information sources;

- assessing the sources—viewing the sources from the point of view of relevance and accessibility (including economic accessibility);
- collecting information—obtaining information relevant to the defined problem and available in matched sources;
- assessing information—from the point of view of relevance, trustfulness, consistency, cause-and-effects relationships, etc.;
- synthesizing information—creating the information product to serve the client by formulating the obtained content via creative generalisation and abstraction;
- delivering the information product—i. e. presenting information for the client.

An information broker can be a specialised entity, but can also be a virtual community, which is called crowdsourcing. As shown, ongoing research into the transfer of the solving some kind of problems to the online space in some cases contributes significantly to the rapid finding of solutions and the development of entities using these solutions (Doan et al. 2011; Poetz and Schreier 2012; Saxton et al. 2013). As research shows crowdsourcing for enterprises in particular involves both—harnessing the collective intelligence and workforce (Hetmank 2013).

There is no single accepted definition of crowdsourcing because it is a concept that is still evolving. However, a synthetic definition of crowdsourcing is proposed by Estellés-Arolas (Estellés-Arolas and González-Ladrón-de-Guevara 2012) as a type of participative online activity in which an individual, an institution, an organisation, or company proposes to a group of individuals the voluntary undertaking of a task. Very important feature of this activity is obtaining the mutual benefit for task providers and recipients. The providers (crowdsourcers) can receive economic satisfaction, social recognition, self-esteem, or the development of individual skills. The recipients obtain and utilise for their advantage everything the crowdsourcers brought to the venture. Crowdsourcing can be applied for a many purposes such as (Parshotam 2013): production (co-creation), availability of standby human resources, problem-solving in research and development, project or venture funding (crowdfunding), forecasting, organisation, tasks performing, innovation/idea generating, solving problem, classification, decision-making/support, or propagating information.

Communication in such an approach is realisation via the web platform, here called a crowdsourcing platform. The crowdsourcing platform is a kind of information broker ensuring providers successfully complete the task requests and the requestors pay for the charges (Vukovic 2009). It can execute crowdsourcing requests in a number of different modes, for example: by advertising them on the marketplace, allowing providers to bid for them or using the form of a competition. Further use of crowdsourcing platforms can allow requestors and providers to connect into the work teams.

There are specialised web platforms dedicated to communication with the community, organisation and individuals under crowdsourcing. Such platforms categorise the available tools, ordering them according to the range and type of functionalities. Two basic categories are tools related to (1) resources necessary for

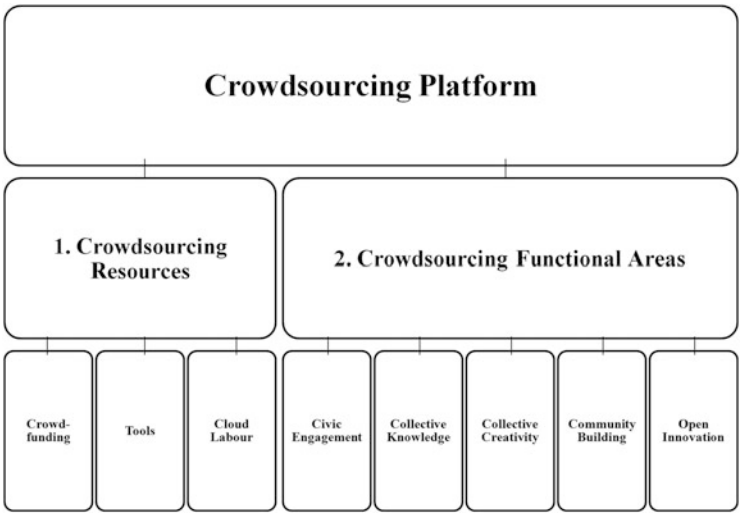

Fig. 2.4 The structure of crowdsourcing web platform (*source*: own research)

undertaking and (2) the specialisation of those carrying out tasks. The detailed division of these tools is presented in (Fig. 2.4):

– crowdsourcing resources:

  - crowdfunding—financial contributions from online investors, sponsors or donors to fund crowdsourcing initiatives;
  - crowdsourcing tools—applications, platforms and tools supporting collaboration and communication among groups and entities;
  - cloud labour—a virtual environment which provides fulfilment of a wide range of tasks on-demand;

– crowdsourcing functional areas:

  - civic engagement—a collective actions in public space;
  - collective knowledge—knowledge and information resources obtained from contributors;
  - collective creativity—obtaining of creative talents for developing original areas of art and science;
  - community building—development of communities through connection and engagement of active entities;
  - open innovation—use external sources for generating, developing and implementing projects and ideas.

The main condition of usefulness that the information provides via the information broker is its content, quality, scope and form of sharing, which requires having specialist knowledge of organisation, management and technology. In view of foregoing, the information broker should be an expert in the area in which they

provide brokering services. These elements provide the direction of brokering services development from information into knowledge brokering (Meyer 2010; Turnhout et al. 2013). This direction is particularly useful for SMEs, where the ability to properly use the acquired information is limited by shortcomings in the area of knowledge.

Knowledge brokering is a strategy or process approach that facilitates the transfer of knowledge between actors. Knowledge brokering serves two purposes (Shaxson and Gwyn 2010):

- to improve the utility of knowledge for a noticeable effect on the quality of decisions, policies and processes;
- to improve the receptivity of decision makers to new knowledge.

A knowledge broker may be an individual, a team or an organization unit. The tasks of a knowledge brokers change depending on the two above mentioned purposes and can be summarized in six different roles (Michaels 2009):

- making-known—disseminating content, targeting decision makers with information, making information easily accessible and digestible; the tools of achieving this role include: factsheets, research synopses, web portals, databases, project seminars;
- link-up—linking expertise to need for a particular research area, helping policymakers address a specific research issue by seeking out the necessary experts; the tools of achieving this role include: project and programme advisory committees, focus groups, linked and specialised websites;
- matchmaking—matching expertise to need across issues and disciplines and helping finding experts with relevant knowledge from another discipline; the tools of achieving this role include: expert advisory committees, research conferences, business and university internships, mapping the specialised databases;
- focused collaboration—constructing formal relationships to focus on a particular issue or contacting people or organizations to provide knowledge on an as needed basis; the tools of achieving this role include: research and development programs, knowledge networks, working and project groups;
- strategic collaboration—lengthening and deepening the collaborative process, strengthening relationships through jointly negotiated methods, tools or/and solutions; the tools of achieving this role include: joint agreements where the emphasis is on equality in the relationships between all actors;
- building sustainable institutions—extending the collaborative relationships to being the one institution; the focus is on co-production of knowledge and joint learning from doing; the arrangements are self sustaining in terms of both funding and function, with all sides contributing resources; the tools of achieving this role include: co-management arrangements, enterprise partnerships, self sustaining consortia.

The above statements have become a premise to propose the project of information technology platform to exchange of strategic information. It is an important tool of knowledge transfer in the range of SMEs competitiveness. Details of this

concept are presented in Chap. 5—*Coordinating Collaborative Benchmarking Group*.

2.4 Business Intelligence Technology

Information brokering requires using advanced IT solutions (Honkola et al. 2010; Kim et al. 2011): web, database and analytical applications dedicated for specific uses and types of information. It is also necessary that applied technology can guarantee high quality, confidentiality and security of data and information. Currently the best suited technology for these requirements is BI (Rostek 2013a).

According to Gartner's[4] the definition—BI is an umbrella term that includes the applications, infrastructure and tools, and best practices that enable access to and analysis of information to improve and optimize decisions and performance. BI allows for the extraction and aggregation of any data type coming from technologically different and heterogeneous sources. Provides a wide range of tools for analytical data processing, including OLAP and data mining analysis. Is able to make flexibly reports of analysis results. There are three main approaches in use BI that depends on the goal of usage BI and the required focus (Rouhani et al. 2012):

- managerial approach with focus on improving management decision making;
- technical approach by focusing on tools supporting the processes associated with intelligence in management approach;
- enabling approach by focusing on value-added capabilities in support of information.

The above approaches are consistent with the Gartner Business Analytics Framework (Fig. 2.5), which defines the elements (i.e. people, processes and platforms) need to be integrated and aligned to take a more strategic approach to BI for analytics and performance management initiatives.

Consequently, it is not enough to make the BI technology available to users. A coherent concept of strategic management has to be developed, and the scope of information supporting this management has to be defined. This explains why the application of BI in SMEs is still minor, even though functional solutions suited to their capacities are constantly being developed.

2.4.1 Technological Framework

One of the key characteristic features of the BI technology that determine its usefulness and effectiveness is the fact that since the first tools entered the market 25 years ago, it has undergone systematic changes, both methodological and

[4] Gartner Inc. is the world's leading information technology research and advisory company.

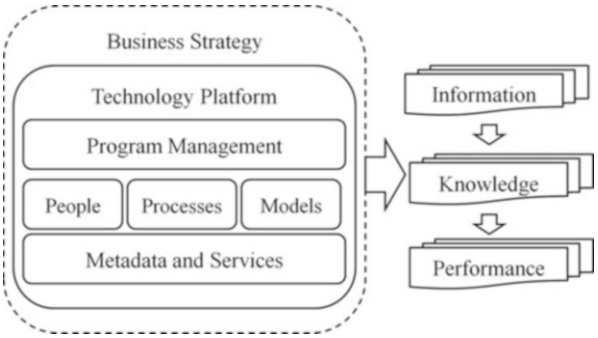

Fig. 2.5 The Gartner business analytics framework [*source*: own research based on (Chandler et al. 2011)]

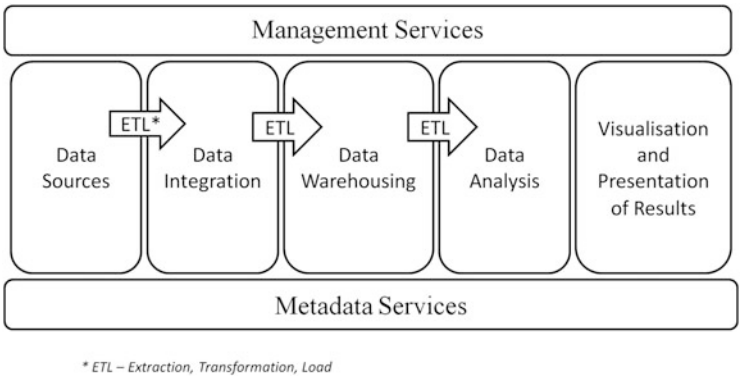

Fig. 2.6 The business intelligence technology framework (*source*: own research)

technological. The architecture of BI technology comprises six layers (Fig. 2.6): (1) the data sources, (2) the data integration, (3) the data warehousing, (4) the data analysis, (5) the visualisation and presentation of results, (6) the management of metadata.

2.4.1.1 The Data Sources Layer

Internet development and the increased network activity of companies influencing the complexity of the source data. The primary internal data sources used, which are usually structured transaction databases, are now supplemented with external data characterised by various degrees of structure (Inmon and Nesavich 2007). In use are heterogeneous data acquired from company's contractors and partners, but also data from text and electronic Internet sources. Data complexity and variety have to be reflected in the process of their integration, whose efficiency determines their utilisation in the system.

2.4.1.2 The Data Integration Layer

An increase in the complexity of the BI system data sources is accompanied by the simultaneous growth in the degree of complexity of the ETL (Extract, Transform and Load Process) technology, which is responsible for the extraction of data from sources and their integration in the system's central repository. This process is also referred to as ETQL (i.e. Extract, Transform, Quality and Load Process) to highlight the significance of data quality in the process of their storage and analysis (Akbar et al. 2013).

2.4.1.3 The Data Warehousing Layer

Data acquired under ETL may be stored in various types of analytical repositories. These may include: enterprises data warehouses (Inmon et al. 2010), data marts (Kimball et al. 2008), operational data stores (Waas et al. 2013) or OLAP cubes (Rivest et al. 2005). Their type depends on the amount, contingency, range and type of stored data. It is also related to the adopted system architecture and method of its implementation and operation. The applied standards are set by various approaches favoured by researches and practitioners (in particular the teams of Bill Inmon (Inmon 2005; Inmon et al. 2010) and Ralph Kimball (Kimball et al. 2008)).

2.4.1.4 The Data Analysis Layer

Data stored in the data warehousing layer are subsequently transferred to the data analysis layer. The scope of analyses to be carried out in the BI system is only limited by the capacities of analytical tools. The most frequently applied analytical methods may be classified into the following groups of analyses: statistical (Ranjan 2009), multidimensional OLAP (Thomas and Datta 2001), data mining (Kantardzic 2011), text mining (Weiss et al. 2005), web mining (Xu et al. 2010), and currently also SNA—Social Networks Analysis (Borgatti et al. 2013).

2.4.1.5 The Visualization and Presentation of Results Layer

Visualisation and presentation of results is particularly important from the user perspective. It is this layer that determines the utility of the tool and its results. It may be supplied in the form of traditional reports and lists, but may also be a data source for a management cockpit (Eckerson 2010) or an information portal (Chan and Chung 2002). It may also be a part of an advisory system that monitors and automatically responds to emerging threats on an ongoing basis (Seufert and Schiefer 2005).

2.4.1.6 The Management of Metadata Layer

Metadata are a logical layer of the BI system. They ensure its correct operation and facilitate system management and administration (Foshay et al. 2014). They also help to recover the system to its condition before a breakdown and to control information security and confidentiality.

The technology framework presented above includes variety solutions used within this technology (as open source BI, BI in memory, cloud BI), which provides the ability to meet the needs and abilities of each type of user, including SMEs.

2.4.2 Business Process Management via Business Intelligence

Business Process Management (BPM) techniques and tools evolve around process models. Process models are used to configure such systems and to analyse "as-is" and "to-be" processes. Unfortunately, these models are often completely disconnected from actual event data. The combination of both process models and event data in BI and BPM integrated system allows for new forms of process-centric analytics (Van der Aalst 2011).

Various types of integration between the BI system and BPM are known, with the most frequently applied one being Business Application Monitoring (Fig. 2.7), in which data from various sources are combined in near-real-time with process-level key performance indicators (KPIs) and visualised via managerial dashboards (Kemper et al. 2013). The role of BI consists in ensuring ongoing process monitoring and enhancement based on the 'Five-R's' cycle, which means (Fig. 2.7): (1) recognition, (2) response, (3) resolution, (4) review to function and (5) delivering ROI (Return On Investment).

The integration of the BI system with BPM at information level ensures (Marjanovic 2010):

- a broader context of process management owing to the possibility to view a single process from the perspective of the interests of the entire organisation,
- making decisions on an ongoing basis without the need to wait e.g. until the end of the month or an even longer reporting period,
- access to complete management information necessary to implement individual stages of the process, which ensures increased safety and accuracy of taken decisions,
- option to easily propagate any information to the recipients at appropriate time,
- option to justify all taken decision owing to a documented source of information.

From the technological perspective, the integration of BI and BPM makes it possible to (Fryman 2007):

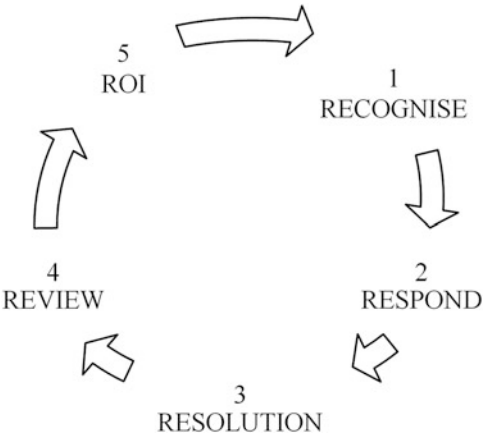

Fig. 2.7 Conception of business application monitoring in the 'Five-R's' cycle (*source*: own research)

- create a joint model of metadata used simultaneously in BI and BPM,
- use state-of-the-art analytical and reporting tools in the management of business processes,
- introduce real-time business process management and make ongoing changes in the course of the process.

2.4.3 In-Memory Analytics

Key difference between conventional BI and in-memory BI is that query data are located in random access memory (RAM) instead at a disk. Normally a query goes to a database and reads the information from multiple tables stored on a hard disk. With an in-memory database all information is initially loaded into memory. From this it follows that accessing data in-memory is more efficient as opposed to accessing that same data from disk. Furthermore the BI architecture needs very little up-front effort and no ETL. That's why it is good proposition for SMEs, tailored to their organisational and financial capabilities.

Another main use for the in-memory approach is to facilitate a more exploratory, visual analysis. Solutions are in this case aimed at supplying advanced graphic data visualisation tools, where the process of creating a report on results is also visualised and operated by a mouse and a cursor.

Benefits arising from the use of in-memory technology include:

- performance improvements—users are querying and interacting with data in-memory which is significantly faster than accessing data from hard disk;
- cost reduces—in-memory approach provides the ability to analyse very large data sets, but is much simpler to set up and administer, because it doesn't need to use data warehouse and ETL tools;

– time reductions—project preparation and system launch are not as time-consuming as in the case of traditional applications due to a lack of a data warehouse and a complex ETL process;
– IT engagement reduces—business users receive self-service access to the right information and possibility of self making reports.

Nevertheless, it is a solution for companies that apart from efficient analyses need to integrate and centralise their data or want to enrich these data through their integration with external sources. That is why the term In-memory Business Intelligence is increasingly often replaced by In-memory Analytics.

2.4.4 Big Data and MapReduce Model

The most common understanding of the concepts of Big Data is such size of dataset which is beyond the ability of typical database software tools to capture, store, manage and analyse (Zicari 2014). But more and more researchers point to the importance of the other features. Patrick Russom (2011) writes that big data must possess the three Vs: Volume (it is a large dataset), Variety (it comes in many formats and can be structured or unstructured), and Velocity (it refers to the speed of generating data). Marissa Mayer (Maltby 2011) suggests that data is defined by the three Ss: Speed (increasing availability of data in real time), Scale (increasing the computing power continues), Sensors (including new types of data, like: social and interactional data or data published by the physical objects—Internet of Things).

Summarising Big Data is not only large volume, but also varied and fast-growing dataset. Such specificity necessitates the use of appropriate technological tools. Thinking about the performance and scalability of classical tools, must pay attention to those that are dedicated to Big Data. These are Map Reduce and Hadoop. MapReduce is a programming model used to handle a large set of data simultaneously. Hadoop is one of the more popular open-source implementations of this model.

The principles MapReduce uses are similar to the distributed grouping and aggregation capabilities that have existed in parallel relational database systems. They are able to scale very well to accommodate for exceptionally large data sets by combining functions of mapping and reducing. The map function transforms each element individually (by grouping and ordering) to an output data element. The reduce function combines input values together (by merging and aggregating), returning a single output value. The final effect of combining these two elements is presenting on Fig. 2.8.

There are many technical and organisational challenges in adopting Big Data technology into the enterprise environment. Concepts of models are created that enable effective and safe implementation of this technology in enterprises. These are often related to the use of cloud computing as a much more scalable environment tailored to the user.

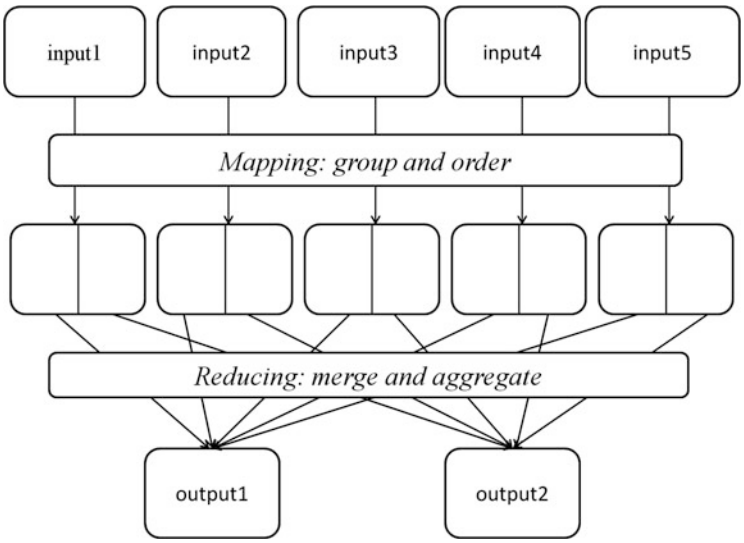

Fig. 2.8 MapReduce model (*source*: own research)

2.4.5 Cloud Computing

Cloud computing (CC) is internet-based and shared resources computing, which are provided on user demand (Ouf and Nasr 2011). CC contains three service models:

- Software as a Service (SaaS)—the consumers use the provider's software applications running on a cloud infrastructure;
- Platform as a Service (PaaS)—the consumers have access to the cloud infrastructure using programming languages and tools supported by the provider;
- Infrastructure as a Service (IaaS)—the consumers have got access to processing, storage, networks, and other fundamental computing resources where are able to implement and run an arbitrary software.

Having regard to the above Cloud Business Intelligence system is used to solve one of three primary customer needs:

- SaaS BI—as an applications package (in the scope of: data visualisations, data analytics and performance management) delivered in time and scope matched to the needs and capabilities of the users;
- PaaS BI—as a scalable applications platform (in the scope of: data warehousing, data integrating, data repository, BI platform hosting) that takes into account individual users' needs which change in time;
- IaaS BI—as a development technological platform (in the scope of: data storage and processing power) that enables embeddable, externally facing applications and sources, needed to solve a specific data analysis problem.

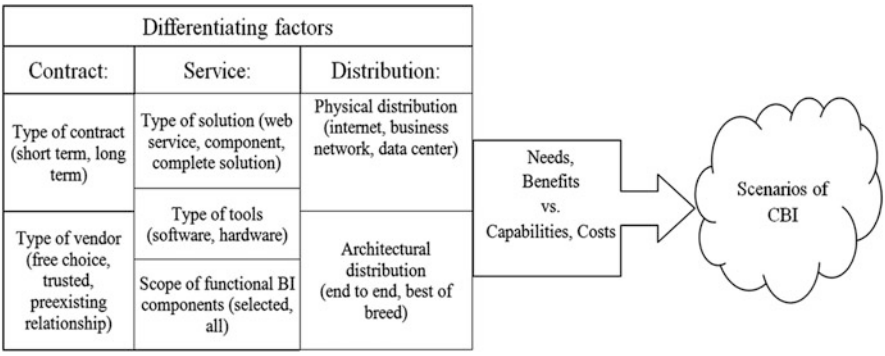

Fig. 2.9 Implementing scenarios for Cloud BI [*source*: (Baars and Kemper 2010)]

Starting from the above characteristics it is possible to propose scenarios variants for implementing BI in CC. The value selection of the three basic elements—(1) contract, (2) service and (3) distribution and their comparison with assessment of costs and benefits (Fig. 2.9) creates suitable scenario schemes.

A significant limitation of using BI in SMEs is the lack of qualified IT personnel, which could take part in its implementation, maintenance of operational capability and actuality. The solution of this problem is moving it to strategic information services provider—i.e. Broker of Strategic Information. The details of a such solution are presented in Chap. 4—*Arranging Collaborative Benchmarking Group*.

2.5 Trust and Risk Management

Given the need to establish cooperation under BCN, the concept of trust has to be considered, without which no cooperation will be effective or even possible. Trust, on which the BCN concept is founded, is consistent with Hosmer's definition (1995). According to this definition, trust is dependency of an individual, an organisation or a group on the freely accepted obligation towards the other party. The objective of trust defined this way is to recognise and protect the rights and interests of entities involved in the joint undertaking and business exchange.

Trust understood as the assumption that one may rely on its partner and that the partner will keep promises and act honestly when given option to do otherwise (Paliszkiewicz 2011) is irrevocably connected with the risk that it will not be so. Henceforth, the definition of trust as the readiness to risk that the other party will act in a way that is significant for the person that places trust (Schoorman et al. 2007). Sztompka (2000) applies an even stricter definition, treating trust as a bet whose object is uncertain future action of others.

Trust is related to uncertainty and risk, but it is a positive concept. It connects social groups, constituting an important element of social capital (Falck and Heblich 2007). It contributes to eliminating anxiety and suspiciousness in an

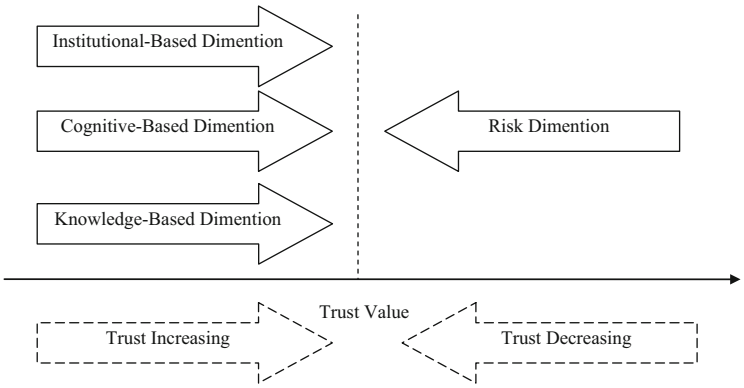

Fig. 2.10 Dimensions of trust value (*source*: own research)

organisation. Owing to this, an organisation becomes more open, aware of its capacities and is ready to face challenges. Trust leads to the achievement of set goals and benefits by all stakeholders, thus having a direct impact on the economic results of an organisation (Grudzewski et al. 2009). This justifies building trust and managing its positive impact on an organisation and its environment.

The trust management model should on the one hand take into account the dimensions of trust that influence its creation and development, and on the other hand consider the risk that is irrevocably combined with the uncertainty of actions related to trust (Fig. 2.10).

The dimensions that shape trust and contribute to its increase include (Fig. 2.10):

– institutional-based dimention:
  - legal—formal and legal regulations that create a safe and ordered space for the establishment of relationships;
  - calculation—trust is based on the calculation of costs and benefits arising from a given relationship, hence on a rational belief that it is beneficial;
– cognitive-based dimension:
  - personality—trust focuses on natural and nurtured personality traits of interacting entities, which guarantee the success of relationship;
  - perceptional—trust results from the perception of others. Since perception is subjective and related to the personality of the perceiver, relationships established on this basis are determined by the personality traits of the perceiver;
– knowledge-based dimension—the most sustainable category of trust based on the gained experiences and skills.

Balance and safety of relationships requires also taking the risk dimension into account (Fig. 2.10). This dimension decreases the final value of trust, but determines holding control over the measures taken on the basis of trust.

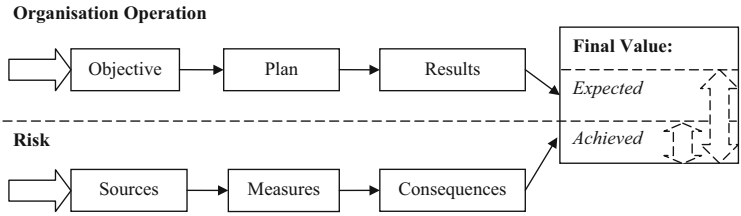

Fig. 2.11 Schema of the risk impact on the activities undertaken in an organization (*source*: own research)

Risk is a concept with numerous definitions, even though people understand and use the term in an intuitive way. It is a function of two basic attributes, i.e. the probability of its occurrence (materialization) and the predicted consequences (profit or loss). A thorough risk analysis allows determination of a more detailed structure. The literature describes the most important elements of this structure (Dionne 2013):

- risk consequences—indicate risk in the form of deviations from the expected value of the intended objective;
- risk sources—highlight the causes (sources) of the risk;
- risk measures—identify the risk with its measures (statistical or probabilistic);
- risk characteristics—accentuate the aspect of uncertainty in the context of the decision-making process.

All of above elements are included in ISO 31000:2009.[5] It is the current gold standard of risk management and presents a schema of risk impact on an organisation's operation (Fig. 2.11).

The activities undertaken in the organisation are determined by the defined objectives, accomplished according to the adopted plan and the effectiveness of their performance is evaluated on the basis of the achieved results. The impact of risk is seen mainly at the stage of comparing those results that have been achieved with those that were expected at the stages of formulating the objective and developing the plan. Reducing the negative impact of risk should take place at the planning stage. During the analysis of risk sources and estimation of its impact, it should be possible to define proper mechanisms for prevention and recovery. The effectiveness of undertaking risk treatment is measured by the difference between expected and achieved results. The organisation should strive for a situation where this difference exhibits a downward trend. An existence of this difference indicates on limitations in abilities of rational planning and predicting the effects of activities and in consequence in abilities in dealing with risk.

The combination of two elements, i.e. trust management and risk management, increases the effectiveness and safety of established collaboration between

[5] ISO 31000:2009. *Risk management—Principles and guidelines.*

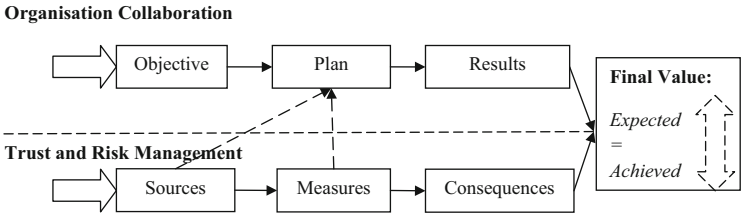

Fig. 2.12 The model of controlled trust (*source*: own research)

organisations in terms of the achievement of defined objectives and completion of tasks (Fig. 2.12).

In accordance with the model presented in Fig. 2.12, each of the constituents (i.e. sources, measures and consequences) has a dual structure—on the one hand it identifies the threats and estimates the related risk, and on the other hand it considers the benefits resulting from the trust that leads to establishing collaboration. Therefore, it is a model that enables the introduction of the so-called controlled trust, which does not hinder collaboration, but rationalises the view of partners and expected benefits.

This model may also be used to identify the elements that are to be included in the collaboration agreement, whose role is to guarantee the safety and usefulness of collaboration for partners. The conditions of creating such an agreement and its structure are described in Chap. 4 (*Arranging Collaborative Benchmarking Group*) and Chap. 5 (*Coordinating Collaborative Benchmarking Group*).

2.6 Summarizing: Concept of Benchmarking Collaborative Network

Integrating the above presented ideas in one common approach leads to concept of Benchmarking Collaborative Network (BCN) presented in Fig. 2.13.

The need to create a BCN is justified by the following claims:

- collaboration between SMEs is necessary to reinforce their competitive potential and will be more efficient than the traditional attitude of competitive fight,
- even though familiarity with the market and factors influencing competitiveness is minor in a single SME, it is much greater in a group,
- competitive collaboration of SMEs requires coordination of measures by an expert with necessary knowledge and skills that SMEs lack.

These result in the concept of BCN, which encompasses (Fig. 2.13) the methods and techniques of competitiveness analysis used to prototype competitive strategies for each member of the collaborating group. The use of the same methods and techniques for a single SME would be inefficient and even impossible.

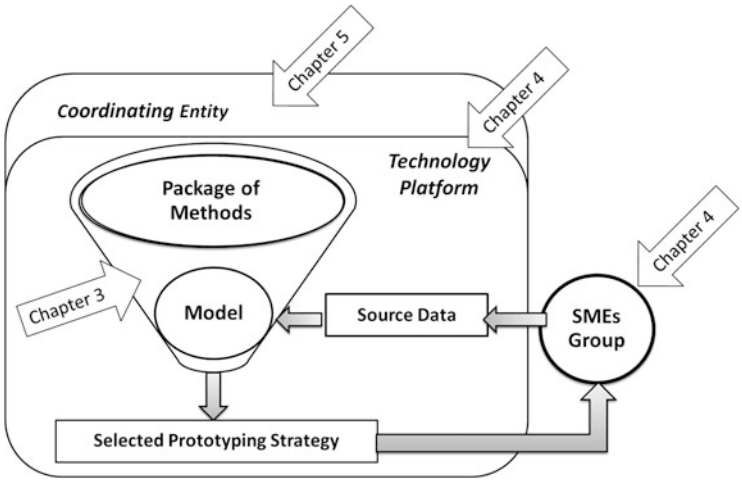

Fig. 2.13 Concept of benchmarking collaborative network (*source*: own research)

Given the shortcomings of SMEs in the area of their skills and knowledge, these measures are carried out by an external coordinating entity. This implies considering the three key elements of BCN's structure, which will be discussed in the subsequent chapters of the present work. These are:

- the method of prototyping competitive strategies for SMEs—Chap. 3,
- the method of organising collaboration within a group of SMEs—Chap. 4,
- the method of coordinating collaboration by an external entity—Chap. 5.

The BCN concept aims to enhance the competitiveness of SMEs to a level that would ensure them more stable operation on a competitive market occupied by small and big business entities.

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