

Prioritizing and selecting KPIs: translate performance results into managerial actions in strategy making process

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Abstract

Purpose: Big data innovations and developments bring opportunities to leverage the impacts of performance metrics on business strategy making process. The purpose of this research is to study the selection of performance metrics based on preferences of strategy makers, and find out what metrics are prioritized in current business strategy makings and how to translate big data insights into meaningful managerial actions.

Design/methodology/approach: The authors prioritized group commitments and commitment KPIs in a case study of a large technical company in Netherlands, using the AHP approach for multi-criteria decision makings. Hardcopy questionnaire and interview sessions were used in collecting data to analyse the prioritization results.

Findings: Based on the prioritization results of business strategies, we find decision makers strongly prefer strategies with financial goals and this preference causes the imbalance of financial and non-financial metrics on the dashboard. The prioritization of metrics is highly influenced by the data availability of management reporting. Prioritization of performance metrics are data driven and bring bottom-up impacts on the dynamics of strategy makings.

Research limitations/implications: With regards to the impact of multi-actor networked decision-makings, the study finds that further research needs to explore factors that impacted strategy making more thoroughly. The conflicted interests of stakeholders, internal policy, and the excessive amount of metrics make strategic decision makings difficult.

Practical implications: The application of AHP in the case study contributes to improving the speed of decision-making processes, providing scientific results on KPI prioritization and selection, and providing an approach to assess the differences between what strategy makers think and what they execute and prioritize on a practical level. The prioritization of performance metrics is a sustainable approach that can be extended to other strategic decision makings as well, for example prioritizing of business model elements or business processes.

Originality/value: This research proves that the multi-criteria decision-making approach AHP can be used to prioritize and identify strategic focus based on selections of performance metrics. The research also demonstrates the importance of combining bottom-up data-driven analytics with top-down strategy making processes in big data developments.

1. Introduction

Information is multiplying at an exponential rate and companies increasingly want to take advantage of fast-moving and complex data to achieve improvements in business performance (Platt et al., 2014). Information technology is positioned as a critical driver for improving business performance by organizational transformations, new business process designs, and new organizational and industry structures (Martikainen & Halonen, 2011). Traditional information systems used by organizations in decision making has primarily

focused on historical events rather than real-time changes (Bhimani, 2015). However, rapid developments and evolutions of big data have been not only challenging the conventional technology but also offering enormous opportunities and advantages for companies that learn how to harness it (AT Kearney, 2013). More than 90 percent of Fortune 500 companies were estimated to have at least one big data initiative in 2013 (AT Kearney, 2013). A recent study reveals that "... Big data now poses a challenge to enterprises in that it arises from wider configurations of information pools – past and present, structured and unstructured, formal and informal, social and economic, and which constantly evolve in their content and representation ..." (Bhimani, 2015). How to unleash possibilities in the strategy making process and create strategic value via big data innovations has become a top concern for a growing number of organizations.

Existing strategy-making process typologies are organized by three themes: rationality, vision, and involvement (Hart, 1992). Since human judgment contains heuristics and biases, the strategic process could not be a fully "comprehensive, exhaustive, and analytical" in approach. The achievable level of rationality is limited by behavioural issues, for example, bounded rationality, satisficing, and political behaviour. To solve implementation problems of strategy making, researchers suggest that "the extent and type of involvement of organizational members" plays a significant role in the process (Hart, 1992). Mintzberg (1987) defines strategy with five Ps: play, ploy, position, pattern, and perspectives. The level of rationality is reflected by first 4 Ps (play, ploy, position, pattern), and the perspectives indicate that strategy-making process is a multi-actor decision-making process (Hart, 1992).

Based on extensive existing empirical studies, firm performance is used to measure the extent of success in strategy making processes. Kaplan and Norton (1996) designed strategy map to help firms translate strategy into operational terms, and they developed the Balanced Scorecard to align organizations to strategies with objectives, targets, and initiatives. The Balanced Scorecard has strong influences on the developments of existing performance management frameworks. Various performance management schemes and key performance indicators (KPI) have been developed and widely applied by organizations all over the world. However, Neely et al. (2008) argues that performance measurement plays a tactical role rather than a strategic role. Traditional financial indicators have been dominating the dashboards of Executive Committee for decades. More than 90 percent of directors and executives of large international corporations believe non-financial indicators are critical, but less than 50 percent are capable to report non-financial indicators (Lacker, 2014). Companies reported that "undeveloped tools" are being used to analyse non-financial indicators (Lacker, 2014). Unlike the dominant roles in operational decisions, enterprise performance management has very limited impacts on strategic decisions due to the lack of integrated technology and poor quality data (Neely et al., 2008).

Nowadays, big data innovations enable organizations to measure all kinds of performances. However, limitless information is being analysed with limited imagination and limited processing power (Priestley, 2015). Despite a little bit more data support, same questions being asked in the past still receive the same answers (Priestly, 2015). To alter the dynamics of organizational decision making and authority, strategic makers are required to articulate big data-drawn insights into "convincing argumentative terms" to support managerial action (Bhimani, 2015). It is critical for firms to identify effective performance metrics to track strategy making process, and translate the results of business performances into "convincing argumentative terms".

Several existing studies have focused on assessing the relationship between strategy decision making and performance measurement, such as evaluate performance of alternative strategic choices (Bitici et al, 2001), prioritize organizational KPIs with SMART criteria and goal settings (Shahin and Mahbod, 2006), select KPIs based on analytic network process approach (Carlucci, 2010), assess a KPI monitor system by using Technology Acceptance Model (Muniandy, 2011), develop a performance metrics repository for business model innovations and implementations (Bouwman et al, 2013). However, most assessment frameworks were designed with a particular focus on certain business scenarios, for example, the after-sales service or business improvement initiatives (TQM, TPM, Six Sigma, et al.). The prioritization and selection were conducted with either a relatively small size of strategic objectives or limited size of key performance indicators. Therefore, a study that takes a more generic perspective on strategy making and performance metrics is necessary to identify which performance metrics are most effective, preferred, and prioritized by strategy makers, especially with

respect to the vast potential impact of big data on business and decision-making processes. To identify the reasons behind the execution gaps between existing strategy making process and performance management system is an essential element for the success of leveraging the power of big data analytics in future strategic decision makings. The current study aims to use Analytical Hierarchy Process (AHP) (Saaty, 1980) as a research approach to identify the most preferred performance metrics based on preferences of strategy decision makers. Because rationality and behaviour issues play significant roles in strategy making process, both qualitative and quantitative criteria are included in the multi-actor, multi-criteria decision-making process. The AHP approach is applicable to fulfil the needs of decomposition, comparative judgment and synthesis of priorities (Shahin & Mahbod, 2006).

This study contributes to academic research by assessing the effectiveness of performance metrics while aligning objectives of business strategy, business models and business processes supported with empirical evidence. The application of AHP in the case study contributes to 1) improving the speed of strategic decision-making processes, 2) providing scientific results on KPI prioritization and creating insights to translate performance results into convincing argumentative terms, 3) providing an approach to assess the differences between what strategy makers think and what they actually executed and prioritized in operations. The present paper is structured as follows. Relevant literature is reviewed and discussed in Section 2. Section 3 explains research methodology in details and Section 4 introduces case descriptions for the application of the AHP approach. Results and research findings are presented in Section 5. Section 6 concludes the limitations and suggestions for further research.

2. Literature review

Strategy becomes a field of study and practices in 1960s. Researchers, practitioners and organizations have extensively defined and discussed strategies and strategic management in past decades. In 1960s, Alfred Chandler defined strategy as “the determination of the basic long-term goals of an enterprise, and the adoptions of courses of action and the allocation of resources necessary for carrying out these goals”. In 1980s, Henry Mintzberg defined strategy with five Ps: plan, ploy, pattern, position and perspective, strategy in his words are more like a stream of actions and decisions rather than planning. In 2011, Max McKeown argued, “Strategy is about shaping the future” with human attempts to achieve “desired ends with available means.” Kaplan and Norton (1996) perceive strategies as “the unique and sustainable ways which organizations create value”. They developed five principles for companies who want to transform to strategy-focused companies with goals to pursue higher business performances, which are: 1) Translate the strategy into operational terms; 2) Align the organization to the strategy; 3) Make strategy everyone’s everyday job; 4) Make strategy a continual process; 5) Mobilize change through executive leadership. Strategy map is designed to help translate strategy into operational terms and the balanced scorecard is designed for the second principle – align the organization to the strategy with objectives, measures, targets and initiatives. The balanced scorecard includes four perspectives: Financial, Customer, Internal Business Processes and Learning and Growth. The four perspectives are not only helpful in combining traditional financial indicators and nonfinancial indicators in the performance management, but also have profound impacts on further designs of business models and business systems. For example, customer and financial perspectives are considered in various business model frameworks. Even though the balanced scorecard is one of the most influential business ideas in past 75 years (Harvard Business Review, 2001), it has pitfalls in implementations. Kaplan and Norton (2001) categorize those pitfalls into two groups: design failures and process failures.

Design failures usually happen in two situations. Firstly, design failures occur when companies use too few or too many measures. Too few KPIs lead to an imbalance between the outcomes they want to achieve and the performance measures that drive the outcomes, and too many KPIs indicate that the critical few are never going to be identified. Secondly, design failures occur “when business units within the company are not aligned with an overall strategy” and each unit develops their own Balanced Scorecard due to their interests. In this situation, no common language is used across the organizations, and the balanced scorecard turns to “Scorecard Babel” (Kaplan and Norton, 2001). **Process failures** often occur when organizations or scorecard projects: “Lack of senior management commitment; Too few individuals involved; Keeping the scorecard at the top; An over-long

development process; Treating the Balanced Scorecard as a systems project; Hiring inexperienced consultants; Introducing the Balanced Scorecard for compensation only” (Kaplan and Norton, 2001). Pitfalls are identified to help managers go through difficulties and make breakthroughs. However, the book does not explain how to avoid pitfalls and how to overcome failures in details. To some extent, big data innovations have not made strategy tracking and planning easier. Instead, pitfalls and failures still exist, and practitioners and managers constantly worry about how to efficiently and effectively track strategy making and implementations based on results of business performances and KPIs. Big data innovations make it possible to measure more metrics than ever before, but leave gaps in prioritizing metrics, aligning strategic objectives, and advising practical relevance and actions.

Business model is positioned as conceptual and architectural implementation of a business strategy (Osterwalder, 2002). To help managers and business model designers achieve desired strategic goals and define relevant measurements for different level of operational implementations, researchers develop a performance metric repository with eight business model perspectives. The perspectives include customer, service, technical, organizational, financial, value exchange, information exchange and process alignment. This performance metric repository instrumentally helps managers design and implement new business models with the goal of achieving strategic objectives and desired performance levels. However, this repository could not provide advice on prioritizing metrics with regards to strategic focus. To assess alignments of business strategies and performance metrics, several studies have developed frameworks to measure the effectiveness of performance measurement system and performance metrics. For example, Bititci et al (2001) evaluate the performance of alternative strategic choices by using Analytical Hierarchy Process (AHP) approach and Shahin and Mahbod (2006) use SMART criteria as goal setting and Analytical Hierarchy Process (AHP) to prioritize organizational KPIs (key performance indicators). The KPI prioritization study of Shahin and Mahbod (2006) provide step-by-step guidelines for decision makers to conduct the prioritization process of SMART KPIs. However, the framework does not provide guidance on appropriate action plan to address deficiencies and only SERVQUAL dimension is adopted in the framework. Followed by the application of AHP approach, Carlucci (2010) evaluates and selects KPIs based on the analytic network process (ANP) based model. His study identifies a set of criteria for multi-criteria decision making and enhance the quality of KPI selection by using exact weights. However, the ANP approach is only applied and tested with only seven KPIs and the selection criteria lacks sufficient theoretical bases.

Generally speaking, both qualitative and quantitative models have been used to make contributions in overcoming the gaps in the design and implementation of performance measurement systems. Conceptual models are more often being used to assess the alignment between strategic goals and performance metrics, and being validated by interviews, surveys or cases studies. Quantitative models are more likely being used to assess the effectiveness of performance measurement system and metrics, for example, the AHP approach or other mathematical iterative models. Past studies indicate that it is feasible to use multi-criteria decision-making approaches to prioritize and select KPIs, especially the application of AHP approach. Even though existing applications of AHP have limitations in providing sufficient guidance on action plans and managerial implications, these studies provide insights on the application of quantitative methods and point out potentials in further research. Thus, based on insights from existing assessment frameworks, AHP approach is chosen in this study to solve the problems of how to assess alignments of strategic objectives and performance metrics, and how to leverage the role of performance measurement in strategy making process with big data insights. Strategy related KPIs are prioritized due to preferences of strategy makers. This study, therefore, contributes to delivering meaningful results and managerial implications that help managers easily translate performance measurement results into convincing argumentative terms in strategy making processes, and eventually overcome execution gaps between strategy making and performance management system with regards to big data developments.

3. Research Methodology

Analytical Hierarchy Process (AHP) is a structured approach developed in 1970s by Saaty. It helps decision makers in analysing complex problems and systems, based on mathematics modelling and psychology theories

(Saaty, 1980). In past decades, the AHP approach and the PC-based software Expert Choice have been widely used by both the public and private sectors, in more than 30 diverse decision-making area including strategic planning, resource allocation and policy makings (Shahin and Mahbod, 2006). Recent studies verified that AHP method can provide a systematic procedure to represent the elements of any problems in multiple decision-making situations, such as choice, ranking, prioritization, benchmarking etc. (Saaty, 1983; Gass, 2011). By applying the AHP approach, both quantifiable and intangible criteria are well utilized in problem-solving frameworks (Vargas, 1990).

The characteristics of strategy making and performance metrics problems in this study fell in one of the decision-making situations mentioned by Saaty (1980). When strategy makers or business model designers build a performance measurement system, both quantifiable and intangible criteria are taken into account. On the one hand, the performance measurements are required to present real facts with reliable data. On the other hand, the practitioners are eager to know which measures or metrics are actually “key” for them to measure and improve the performance of systems. The multi-actor, multi-sector, networked-enterprise environment makes the decision of prioritizing or selecting key performance indicators a complex problem. The application of AHP method can provide solid mathematical and psychological bases for decision-makings with a particular focus on prioritizations, which greatly contributing to avoid the selection and design of KPIs that are solely based on “gut feelings”. Meanwhile, recent studies have shown the feasibility to select or prioritize KPIs with the AHP method, and confirmed the selection can deliver meaningful guidance and managerial implications (Shahin and Mahbod, 2006; Carlucci, 2010). It is suggested that AHP will be a significantly useful method to prioritize the performance indicators, provide insightful guidance and actions for performance management, and contribute to fill the conceptual and execution gaps between business goals and performance measurement.

In order to organize decision makings and generate priorities, Saaty (2008) propose four steps to decompose the decisions: “1) Define the problem and determine the kind of knowledge sought; 2) Structure the decision hierarchy from top to down. Starting from the top - the goal of the decision, then the objectives from a broad perspective, followed by the intermediate level criteria on which subsequent elements depend, to the lowest level, a set of alternatives; 3) Construct a set of pairwise comparison matrices; and 4) Use the priorities obtained from step 3 to weigh the priorities until the final priorities of the alternatives in the bottom level are obtained. To adapt above steps in this study, the procedures are formulated and illustrated in the following flow chart (Figure 3.1).

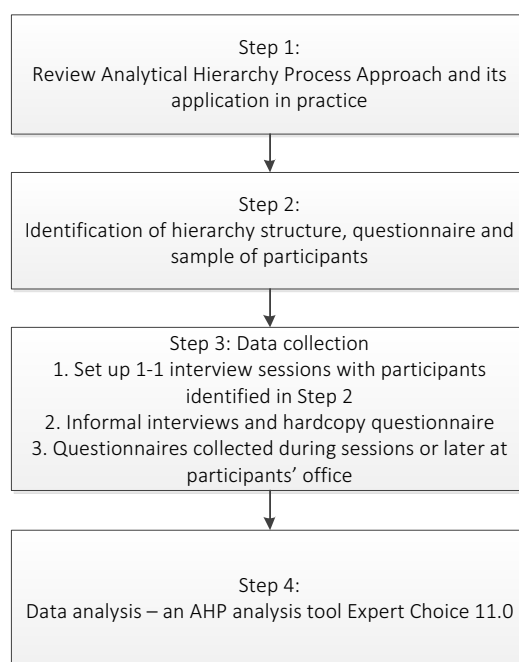


Figure 3.1 – Steps of research method in this study

As presented in Figure 3.1, in step 1, a brief review of AHP is provided in this chapter to create a better understanding of the research approach. Next, in Chapter 4, the AHP approach is applied in a real case, the questionnaire and sample of decision-makers are determined based on analysis of case descriptions. In step 3, interview sessions are set up to conduct informal interviews and complete hardcopy questionnaires. Data collected in step 3 are analysed in step 4 with the help of an AHP analysis tool - software Expert Choice 11.0. Examples are given to explain how the software process data analysis. Finally, the consistency ratio is provided to check the degree of logical respondent opinions and eliminate illogical respondents. The results of the AHP application in the case are discussed in Chapter 5.

4. Case description and the application of AHP approach

This study focuses on the research domain of prioritization and selection of performance metrics of [REDACTED] a large technology company with multi-sector and complex enterprise environments. As a corporation [REDACTED] it always strives to improve people's lives through meaningful innovations. [REDACTED] strong capability in research and its competitive advantage enable the company to achieve its visions. However, the internal operational issues hampered the business performance the most [REDACTED] despite the slower market growth and margin pressure from higher material prices. Quoting from the present CEO [REDACTED] in an interview, "... the one thing where we need to improve most is operational excellence. It is in fact that lack of operational excellence that slows us down. If only we can bring our innovation faster to market, without waste, without mistakes, we will impress our customers so much more". This quote emphasizes the urgency to thoroughly examine the operational issues.

To monitor the status of operations and steer business performances on a strategic level, a common and standard structure of management reporting is required. Now, each business group autonomously manages and reports its operational performance, this results in a large number of performance indicators and difficulties in comparing performances across business groups, markets or functions. For example, the KPI [REDACTED] used to have two different definitions and calculations in business group Lighting and business group Healthcare. Markets in Europe and Markets in North Latin America have different customizations on SAP systems (enterprise software to manage business operations and customer relations) that lead to different results of a KPI. The high variety of operational performance indicators and performance management system makes it difficult to devise an actionable strategic plan. Thus, the performance measurement team is leading the design and implementation of a new standard performance management system. However, this team gets resistance from business groups when harmonizing various performance metrics' definitions into a standard one. The new standard performance management system still contains a large number of performance metrics. The executives, operation managers, and the performance measurement team recognize that a large number of performance metrics is diluting focus of business activities and reducing the effectiveness of the new performance management system. The executives are searching ways to re-assess the effectiveness and priorities of metrics. It is unclear which metrics are critical to analyse business performance, to generate business values, and to align objectives of business strategy, business models and business processes.

4.1 Strategy and Commitment KPIs

The Executive Committee at [REDACTED] defines strategies with visions, missions and group commitments. Visions, missions, and group commitments illustrate what a company aims to achieve and lead strategic planning and annual operation plans. The execution of each group commitment is tracked by several commitment KPIs on commitment dashboard. Group commitments and commitment KPIs are updated yearly to reflect strategic changes. In 2015, the commitment dashboard contains [REDACTED] commitment KPIs that defined and selected by the Executive Committee. The structure of group commitments and commitment KPIs are presented in Figure 4.1.

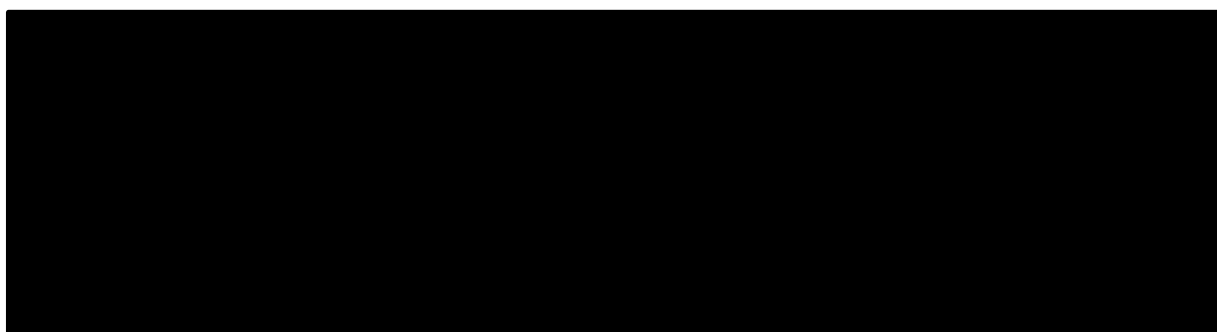


Figure 4.1 – Group commitments and Commitment KPIs

Figure 4-1 illustrates the structure of group commitments and commitment KPIs. For example, to measure the performance of sub commitment [REDACTED] seven KPIs are reported on the commitment dashboard, including EBITA, ROIC and etc. (Table 4-1). Detail definitions of commitment KPIs are listed in Appendix B.

Table 4.1.1 – Group commitments and Commitment KPIs (1)

Sub commitments	Commitment KPIs
[REDACTED]	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]
	[REDACTED]
[REDACTED]	[REDACTED]
	[REDACTED]
[REDACTED]	[REDACTED]
	[REDACTED]

Table 4.1.1 shows that most KPIs belong to the first group commitment [REDACTED] [REDACTED] are financial indicators, for example, earnings per share or working capital. These financial indicators are not only being decomposed to targets for lower management groups, but also being used for external stakeholders and investors to compare and assess business performance of the company in the market. Another two KPIs that related to sustainability and improved lives metrics are special measures to reflect [REDACTED], they are calculated and reported separately on the dashboard.

Table 4.1.2 – Group commitments and Commitment KPIs (2)

Sub commitments	Commitment KPIs
[REDACTED]	[REDACTED]
	[REDACTED]
	[REDACTED]
[REDACTED]	[REDACTED]
	[REDACTED]
[REDACTED]	[REDACTED]
	[REDACTED]

leverage the power of data and boost sales from online platforms, and KP [REDACTED] is specifically defined to track online sales performance. Other KPIs such as [REDACTED] and [REDACTED] are measures to track general implementation rate of this strategy. Most commitment KPIs are reported quarterly along with the publication of company's quarterly revenue. Some KPIs are reported monthly because they are project related and need more timely reporting, for example, [REDACTED]. A specific IT team builds the dashboard and the global performance management team collects data via managers and market controllers. The commitment dashboard has a limited number of business users because the confidentiality of information and its reporting tool is different from the other management reports at [REDACTED].

Comparing these group commitments with the balanced scorecard reviewed in literature studies, it can be concluded that the balanced scorecard has strong impacts on the design and selection of commitment KPIs. They all start with "vision and strategy" as a core. The commitment KPIs can be categorized into four perspectives (financial, customer, internal business processes and learning and growth) as well, for example, EBITA and market share are financial indicators, NPS and customer service level are customer related, implementation of business models are internal business processes and employee change adoption and integrity are learning and growth related. However, the failures and pitfalls of balanced scorecard exist on current commitment dashboard as well. For example, too many KPIs [REDACTED] and the scorecard is kept at the top level. It is unclear how to prioritize commitment KPIs and how to make sure the real important performance drivers align with strategic priorities and business models. Thus, the AHP approach is chosen to deal with the prioritization problem and overcome pitfalls. In the next section, the hierarchy tree and questionnaire for AHP application are explained.

4.2 The hierarchy tree

The scope of this study is to prioritize commitment KPIs and assess the alignments among strategy, business models and performance metrics. Thus, the evaluation goal of this AHP application is determined as "Select the most suitable KPIs for tracking strategy executions" and it is presented as the first level of the hierarchy tree. Generally speaking, a designer can design as many levels as needed in a hierarchy tree (Nikou, 2012). However, in this research, disregarding the first level "evaluation goal", there are another three levels: evaluation factor, evaluation attribute and evaluation measurements (alternatives). The hierarchy tree is presented as follows.

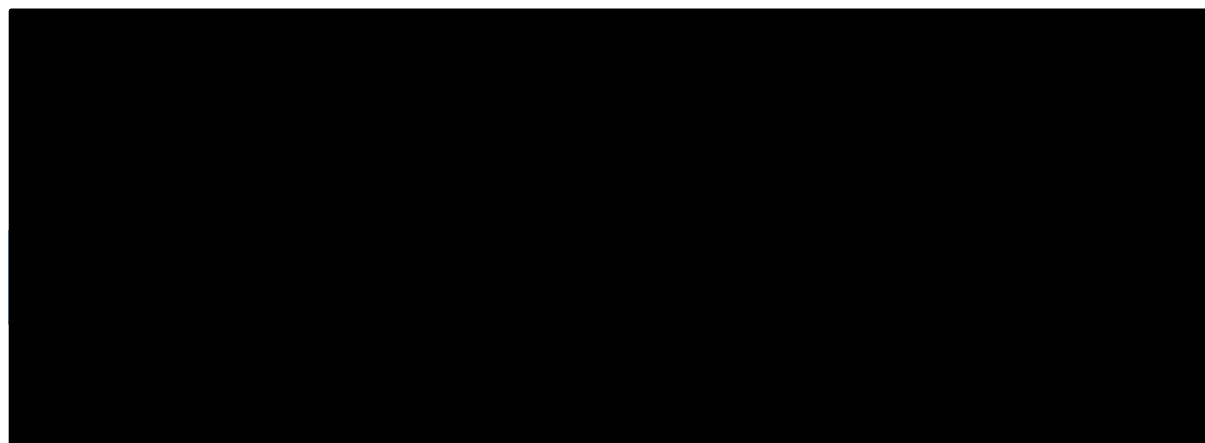


Figure 4.2 – the hierarchy tree

The above hierarchy tree is derived from the structure of group commitments and commitment KPIs presented in Figure 4.1. Three top Group commitments are designed as "evaluation factors" on the second level, and sub commitments are designed as "evaluation attributes" on the third level and the commitments KPIs are designed as evaluation measurements (so-called alternatives) on the fourth level.

4.3 The questionnaire

After decomposing the problem into a hierarchy tree, elements (factors, attributes and alternatives) on each level have to be pair-wise compared. Elements are pair-wise compared based on its relative importance to the parent level. The scale below is used to express the level of relative importance in pair-wise comparisons (Table 4.3). This scale is designed based on past AHP studies and the setup of questionnaires in Expert Choice 11.0.

Table 4.3 – Scale for pair-wise comparison (Adapted from Nikou, 2012)

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities considered equally important
3	Moderate importance of one over another	One activity is marginally favored over another
5	Essential or strong importance	One activity is strongly favored over another
7	Very strong importance	One activity is very strongly favored and its dominance is demonstrated in practice
9	Extreme importance	The evidence favoring one activity over another is of the highest possible order
2,4,6,8		Intermediate values between two adjacent judgments

Hardcopy questionnaire was used in this research to collect data from pair-wise comparisons. The questionnaire was designed based on the study of Nikou (2011). First, a draft questionnaire was designed. After the test of experts and some potential participants, the questionnaire was revised based on the feedback and comments. An example of the questionnaire is provided in Appendix A.

4.4 The sample

Because commitment KPIs and dashboard are strictly focused on the strategic level, the amount of its owners is quite limited. Also, it is not mandatory to use a representative sample because the AHP is a method focusing on decision making instead of decision makers (Nikou, 2011). Researchers assert that many AHP studies had used a small sample of data. It is always required that participants have a certain level of knowledge with respect to the topics (Nikou, 2011). In reality, it is a small group of managers who know and work with company strategy and strategy KPIs. Most of the participants are senior managers or directors who are owners of commitment KPIs from different business groups or functions in the company. Table 4.4 lists information of 11 participants who completed the questionnaires. Questionnaires are distributed and collected via face-to-face meetings at [REDACTED]

Table 4.4 – Information of participants

Participants	
Program manager	[REDACTED]
Program manager	
Head of Global Performance Management	
Business Analyst	
Business Analyst	
Business Analyst Operations	
Senior Director	
Business Transformation Manager	
Controller Markets	
Head of Performance Management	
Process Performance Director	

4.5 Data collection, analysis, and the consistency ratios

In order to increase the response rate, one-on-one interview sessions were set up to meet participants (Table 4.4) and collect hardcopy questionnaires. While participants were filling in the questionnaires, informal interviews were conducted to gather their opinions on “a large number of KPIs” and “KPI prioritizations”. The sessions are structured as follows:

- 1) Introduction: Background information. Research goal/scope/method/interview set-up
- 2) Informal interview: Problems and challenges. KPI selection criteria. The links between KPI and business models
- 3) Hardcopy questionnaires: Participants do pair-comparisons regarding to group commitments and commitments KPIs
- 4) Reflection: Feedback from participants to the questionnaire and the research

In total, 15 participants join the interviews, and 11 questionnaires were completed and collected during the sessions. Four participants did not respond to the questionnaires due to limited amount of time.

After collecting all the pair-wise comparison questionnaires from participants, data are analysed in AHP software – Expert Choice 11.0. Expert Choice is a decision-making tool developed by Saaty and Forman in 1983. It has been widely used in different areas of decision-makings in the past. Some examples of how data is analysed in the software is given in Appendix C.

According to existing research, a majority of AHP studies use 0.10 as acceptance consistency ratio. However, in practice, the consistency ratios exceed 0.10 quite often, specifically if the logic at state is complex (Nikou, 2012). Thus, this study decides to accept questionnaires that had an overall consistency ratio up to 0.19 for data analysis. Two questionnaire have too high consistency ratio (i.e. participants give inconsistent answers) and are excluded for data analysis. The overall consistency ratio of a combined result is 0.02, which is quite acceptable for priority ranking and weightings.

5. Results

In this section, results of applying AHP approach in KPI prioritization are discussed and elaborated. Section 4.1 presents the priority ranking and weight of main strategies (Group commitments and sub commitments). To explore the alignment of strategy and performance metrics, the priority ranking and weight of commitment KPIs are discussed in Section 4.2. The contributions and limitations of this study are concluded in the next chapter.

5.1 Priority ranking and weight of Group commitments

The scope of this AHP application is the prioritization of Group commitments and commitment KPIs at [REDACTED]. The Group commitments represent strategies of the company. Therefore, the priority ranking of Group commitments indicates preferences of decision-makers on the importance of each strategy. Table 5.1.1 presents the combined results of priority rankings and weight of Group commitments and sub commitments.

Table 5.1.1 Priority ranking and weight of Group commitments

Priority ranking	Evaluation factor	Weight
1	[REDACTED]	0.540
2	[REDACTED]	0.281
3	[REDACTED]	0.179

Table 5.1.1 indicates that participants see “[REDACTED] (strategy 1)” as the most important strategy at [REDACTED]. Strategy “[REDACTED] (strategy 3)” and

“(strategy 2)” ranked the 2nd and the 3rd. The results indicate that participants strongly favour the strategies with objectives such as growth, improvement or progress, and strategies with objectives such as operations and transformation has a lower preference. According to one of the informal interviews conducted during the pair-wise comparison, the manager defined strategies as “to help employees to find how to contribute to achieve visions”. Another business strategy analyst defined strategies as “what you want to improve or achieve as a company”. Their definitions of strategy help to explain why ranked the top priority. This Group commitment gives meaning to the visions of the company, while another two commitments tell more about how to contribute to achieve the visions.

Usually for strategic planning, visions and growths are always set up with targets, because the top management team needs to make sure visions and growths are measurable and can be decomposed to the lower management to operationalize them. Therefore, financial indicators still take the lead in the strategic dashboard. On the one hand, financial indicators provide the performance of a company for external stakeholders to evaluate the business. On the other hand, they have been heavily used in goal cascading of strategic objectives and target setting for business units and function groups. Meanwhile, strategy has been ranked with the lowest priority, this indicates the company is still lacking focus on the operations. The priority ranking results of sub group commitment support above statements as well (Table 5.1.2).

Table 5.1.2 Priority ranking and weight of sub group commitments

Priority ranking	Evaluation attribute	Factor category	Relative weight
1			0.314
2			0.163
3			0.115
4			0.086
5			0.079
6			0.062
7			0.045
8			0.042
9			0.034
10			0.031
11			0.028

Table 5.1.2 shows participants see “ ” as the most important sub commitment. “ ” and “ ” are prioritized as second and third. This result indicates that, besides financial targets, “ ” also has strong focuses on customers and business categories, which provide the trend and directions for strategy executions. Out of 11 sub commitments, top 5 strategies are related to sales growth, market share, customer value, investment and business plans. By combining the current state of the company (split one company to two), second group of priorities focus much more on the value creation of separate

Previous sections discuss findings of prioritization results of strategies and impacts of strategic KPIs on business model designs. This section will strongly focus on discussions of priority and ranking results of commitment KPIs. Table 5.2.1 presents the priority ranking and weight of commitment KPIs at [REDACTED]. How the AHP approach and KPI prioritization contribute to solve research questions of this study will be explored as well.

[illegible]

■	████████████████████	██████████	■
■	██████████████	██████████	■
■	██████████████	██████████	■
■	████████████████	██████████	■
■	██████████████	██████████	■
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(Note: Group Commitment1: Accelerate our growth and improve our performance; Group Commitment 2: Executing the Accelerate! Transformation; Group Commitment 3: Progressing on our strategic priorities).

Firstly, Table 5.2.1 shows the imbalance between financial metrics and operational metrics, which correspond to findings in previous sections. Table 5.2.1 presents priority-ranking results of ██████████ KPIs. Within the top ten commitment KPIs, only one indicator ██████████ is not financial related. In last ten KPIs in the table above, only two or three KPIs are directly linked to financials ██████████ ██████████ and others are operational KPIs ██████████ or project related KPIs ██████████. On the one hand, this prioritization results confirm alignments of strategic KPIs and strategic focus on customer values and value generations. On the other hand, this indicates decision makers on the executive management level have not given enough attentions on operational issues. Metrics presenting performances of operational excellence and customer satisfactions still stay in the dashboard with low priorities, for example, ██████████ (33rd/46) or ██████████ (34th /46).

Secondly, we find the data availability of performance metrics impacts the preferences of decision makers. Executives and senior managers are more likely to choose existing performance indicators that have been frequently used in the past than new metrics that are just being defined or developed. Within top 20 commitment KPIs, only a few metrics are relatively new, for example, ██████████ (15th /46) or ██████████ (20th/ 46)", others are common metrics used in the industries. Change management is one of the significant issues that can explain this finding. But, besides change management, we find out the large impacts of data availability on KPI selection preferences. According to discussions with managers, some KPIs are extremely difficult in finding the right data, for example, ██████████ (36th /46), ██████████ (37th /46), ██████████ (42nd /46) or ██████████ (44th /46). Either these metrics are "forecast" related and it is difficult to predict future performances or business analysts simply have no idea how to get the data, and too many human interventions are involved in data collection. Managers are expecting a fully automated IT infrastructure to enhance data availability. However, the prioritization of performance metrics should not be data-driven. Strategic priorities and business goals should drive the selection of performance metrics.

6. Conclusion and limitations

Many studies have explored concepts of strategy, business model and performance metrics, providing a wide variety of definitions, approaches and frameworks, etc. However it is far from clear to researchers and practitioners how to overcome pitfalls when translating strategy into performance metrics (Kaplan & Norton, 2001), how to build and measure alignments of strategy and business model via performance metrics (Bouwman et al, 2013), and how to ensure performance management system efficient and effective (Neely et al, 2008). All these how-to questions signify at least one essential quest for researchers, and that is to study and develop analytical approach to understand how to solve problems when implementing and operationalizing business model designs and performance measurement system in practice. As extensively discussed in literature studies, existing studies and frameworks are mostly high-level conceptualized with empirical studies in individual organizations. Studies on networked organizations with quantitative analysis and actionable advice are lacking.

The research domain of this study is an example of a large networked company facing problems in design and implementation of a new integrated performance management system [REDACTED] as a technology company with multi-actor, multi- sector, networked environment, is striving to improve operational excellence via business transformation programs. Performance measurement plays a significant role in tracking business strategy executions and reflecting reliable performance results of operations. However, as explained in case descriptions, managers and performance measurement team at [REDACTED] are currently losing focus and drowning with a large amount of KPIs for management reporting. Strategies are interpreted as Group commitments and measured by commitment KPIs, but besides financial targets, objectives and performance metrics of strategies and business models are hardly linked or aligned. The maturity of business model designs and implementations is low and only metrics of business processes are linked to business models. Executives and managers keep asking questions such as “what the real key important metrics are driving performance improvement” and “how many KPIs and metrics are enough to effective Performance Management”.

6.1 Findings and contributions

Existing frameworks and studies on alignments of strategy, business model and performance metrics are reviewed in chapter two. Only a few studies take the alignments of business models and business processes into consideration, and several studies point out the Analytical Hierarchy Process approach can be applied in selecting strategy alternatives and prioritizing performance metrics. Based on the findings of literature reviews, chapter three describe the case in details, including how the strategy, business model and performance metrics are designed and implemented in the company at this moment. One of the most server problems of performance management at [REDACTED] is the large amount of KPIs dilute the focus of executions and operations. To help managers regain the focus, we choose the AHP approach as a research method to prioritize KPIs. To make the prioritization feasible and effective, the scope of this AHP application is limited to group commitment KPIs. How to apply AHP approach with KPI prioritization is discussed in research design chapter four.

The findings in the prioritization results of group commitments and commitment KPIs are discussed in chapter five. From the perspective of business strategy, we find decision makers strongly prefer strategies with objectives such as financial growth, improvements or progress and strategies related to operations and transformation have lower priorities. The preferences of financial strategy and operational strategy lead to the imbalanced number of metrics on commitment dashboard. From the perspective of business model designs and alignments of strategy and business model, we find out not all the business perspectives defined in theoretical research are covered in business model designs of this case. Business models, in this case, have much more focus on customer value, finance, service, and value exchange and process alignment. However, other perspectives such as organization, technology and information exchange are missing when aligning strategic metrics with business models. To a large technology company like [REDACTED] strategies and strategic KPIs are defined and reported at a higher level. Detail technology and information exchange metrics are defined to measure performances of business processes, not business strategy or business model. From the perspective of performance metrics, the prioritization results indicate the imbalance between financial metrics and operational

metrics. Meanwhile, we find besides change management concerns, the selection and preferences of performance metrics are influenced by the data availability of management reporting. Low availability of data collection leads to low priority rankings of KPIs and low willingness to implement and use the KPIs as well. In general, the KPI prioritization provides a quantitative approach to assess the alignment of strategy and business models. Also, this AHP application enables managers to check and speed selections on KPIs as well.

6.2 Managerial advice and business contributions

This study of KPI prioritization contributes to solving practical problems in this case and other management environments in three ways:

1) Provide scientific results on KPI prioritization and selection instead of managers' guts

"How many KPI's and metrics are enough for effective Performance Management to occur?" is a question has been asked by managers so many times. Bob Champagne (2008), as a consult with over 25 years of performance management experience, he pointed out that when this type of questions is being asked, most of the time, "they believe 'in their gut' that their measurement system has gotten a bit unwieldy, and is starting to create breakdowns, confusion and loss of whatever momentum they once had. And they are usually right". Too many KPIs, the quantity itself created a dilution of focus, so how to regain the focus and set up clear priorities? To get the measurement framework leaner, one of "healthy" practices proposed by Champagne (2008) is to "Set aside time for 'pruning'". KPI pruning includes 1) dropping measures which are no longer relevant or no long adding value, 2) evaluating and strengthening the unclear linkages upward and downward, and 3) replace old measures when new business objectives identified (Champagne). To prioritize and select a set of KPIs and performance metrics with AHP approach shares similar initiatives with KPI pruning. The ultimate goal of KPI prioritization is to trim down the large amount of performance metrics and improve efficiency and effectiveness of performance measurement system.

In this study, commitment KPIs are prioritized based on managers' preferences on the importance of metrics. Although the final priority-ranking list of KPIs does not directly tell which KPI should be removed or replaced, the prioritization results can provide insights on which KPI is relatively more important for KPI selections and eliminations. According to a business analyst from operational excellence team at she told us most KPIs in her team were selected by managers based on their experiences and their "feelings". The managers from global performance management team and business process management team told us, too many KPIs are directly picked up from industry standards and academic research, but those KPIs are too generic to address the specific focus and needs of the company. The Analytic Hierarchy Process is an approach that capturing both qualitative and quantitative criteria for decision-makings. The KPI prioritization based on AHP approach will be able to back up further KPI selection decisions with scientific evidence rather than solely based on managers' gut feelings.

This KPI prioritization study is sustainable and can be extended to other sets of performance metrics as well. For example, the prioritization approach can be applied to metrics of business models and business processes. On the one hand, the prioritization of different sets of metrics can be compared to check the alignments of business model designs and process designs. On the other hand, if a set of metrics frequently has low priorities, and being confirmed by managers that these metrics are no longer useful or have added value according to current business objectives, then those metrics can be pruned. By following these steps, low priority KPIs can be removed or replaced due to the change of business objectives. In the end, the large amount of KPIs can be trimmed down through multiple prioritization tests.

2) Provide a way to regain focus and assess differences between their thoughts and actions

Metrics with low priorities can not only give indications on KPI elimination, but also can be used to assess differences between what managers think are important and what they prioritize in practice. For example, in the results of this study, operational Commitment KPIs have relatively low priorities that are contradictory to one of their strategic priorities "improve operational excellence". Some managers argue that comparisons between financial indicators and operational indicators are like comparing an apple to a pear. But the AHP is an

approach enables decision makers to compare apple to pear due to certain criteria. Besides, the prioritization result itself can be used to reveal some unreasonable designs of dashboards. For example, to prevent data driven behaviours, some metrics are ranked with low priorities are not caused by their importance but caused by the difficulties in data collections; to reduce human interventions on dashboard designs and strategic behaviors on KPI selections, some metrics are ranked with low priorities may be caused by personal interests or conflicted interests. Comparing the strategic priorities defined by executives and priorities of metrics ranked by managers, the objectives and focus can be assessed and aligned.

3) Improve the speed of decision-making process to reach real time performance tracking

Another problem pointed out by a business analyst from performance measurement team, he said one of the difficulties to trim down the number of KPIs is because business analysts are reluctant to take ownership of problems and make decisions. Because this is a large company with complex organization structure and various decision-making boards, it is easy to understand why the decision-making processes are slow. But how to help managers to speed up when they have so many priorities at hand with only limited time? The KPI prioritization provides a way to help managers make decisions faster and reliable. The effectiveness of AHP approach has been testified and verified in multiple areas in past decades, but few studies apply AHP in the selection of a large set of performance metrics. This study shows the potential to use multi-criteria decision-making approach to quickly select the most suitable indicators based on criteria of business goals and objectives.

Moreover, this study provides actionable managerial advice. Opinions regarding to solve “the large amount of KPI” problems are collected during informal interviews. One of the program manager from Global Performance Management team mentioned, “in order to trim down the number of KPIs, we need to ‘cut the dead wood’: 1) decrease duplicate KPI definitions, 2) withdraw the KPIs which are not implemented”. “Cut the dead wood” shares same thoughts with KPI pruning. Another manager from performance measurement team suggests “to link performance metrics with job descriptions of individuals” in order to add more clarity in responsibility and performance controls. This suggestion is coherent with the KPI selection criteria SMART. Make sure all metrics are well “assigned” could be a way to prevent indecisive behaviors. We suggest that the company should adjust the balance of performance metrics and update the frequency of management reporting. It is essential to keep tracking all the existing financial indicators for stakeholders. But in order to solve internal operational issues, at least one or some operational metrics should be able to reflect daily or weekly business performances. In this fast-changing world, data should be used to leverage business capabilities instead of constraining the power of analysis.

6.3 Limitations

The findings of this study should be interpreted with the following caveats in mind as well. Firstly, this study is limited in the fact that the proposed KPI prioritization is only applied in one large technology company in the Netherlands. The limitation is defined by differences between different companies, industries or countries. Although the metrics prioritized in this study are possibly adaptable to similar cases, the analysis and conclusion of prioritization results are only relevant when considering particular strategic focus and business model designs of a company. Secondly, this study is restricted by limitations of AHP approach. For example, the only way to formulate problems and the hierarchy structure is to follow the perception of the individual (or the group of individuals) and it is critical that when to aggregate opinions in AHP applications (Hartwich, 1999). When the number of pairwise comparisons increases, the whole process of AHP may be time consuming. Researchers suggest applying simpler multi criteria methods to avoid this limitation.

Moreover, the impacts of performance metrics on strategy making process are limited due to other multi-actor decision-making aspects. Even though the AHP approach provides a way to prioritize performance metrics based on preferences of strategy makers, the results of prioritization can hurt interests of a small group of stakeholders. To some extent, the strategy making process and discussions may end into a stagnant status with no further agreements achieved. Instead of intensifying the conflict interests during strategy making, we suggest practitioners periodically use the KPI prioritization as a reflection of dynamics in strategy makings. The prioritization of performance metrics can be used as a starting point to initiate discussions, but it can only bring

limited impacts on the choice of business strategy or the change of strategic focus. Big data innovations and developments make it possible to measure all kinds of metrics and processes. The KPI prioritization can be positioned as a bottom-up data-driven method to identify problems in strategy makings. However, a top-down approach starts with visions and particular focus on operational efforts may become a beacon in big data analytics. Combing the top-down approach and bottom-up finding, the big data insights can eventually be transformed into meaningful managerial actions with desired strategy makings.

6.4 Further research

Further suggestions for future studies concerns the consideration of applying the AHP approach with metrics directly defined from business models and business processes designs. The proposed AHP-based model has limitations on assessing alignments of business models and business process via performance metrics. Therefore, a further development of the research should be related to improve the model by particularly focus on business model designs aspects and the selection of related metrics while addressing the barriers of a large amount of metrics. Finally, the model is open and replicable for future development. In conclusion, this paper proposed a KPI prioritization framework with the application of an AHP approach. This KPI prioritization can help with the selection of performance metrics and assess the alignments of business strategy, business models and business processes. This study contributes to providing exploratory evaluations of a quantitative approach to the developments in managerial decision-making and performance management.

Appendix A

See Tables A1, A2 and A3.

Table A1

Example of the pair-wise comparison questionnaire. Please compare the relative importance with respect to prioritization of group commitments.

Prioritization of group commitments		
[REDACTED]	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	[REDACTED]
[REDACTED]	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	[REDACTED]
[REDACTED]	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	[REDACTED]

Table A2

Example of the pair-wise comparison questionnaire. Please compare the relative importance with respect to prioritization of sub group commitment “Accelerate our growth and improve our performance”.

[REDACTED]		
[REDACTED]	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	[REDACTED]
[REDACTED]	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	[REDACTED]
[REDACTED]	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	[REDACTED]

Table A3

Example of the pair-wise comparison questionnaire. Please compare the relative importance with respect to prioritization of “Meet our 2015 financial commitments on sales growth, profit and cash generation”.

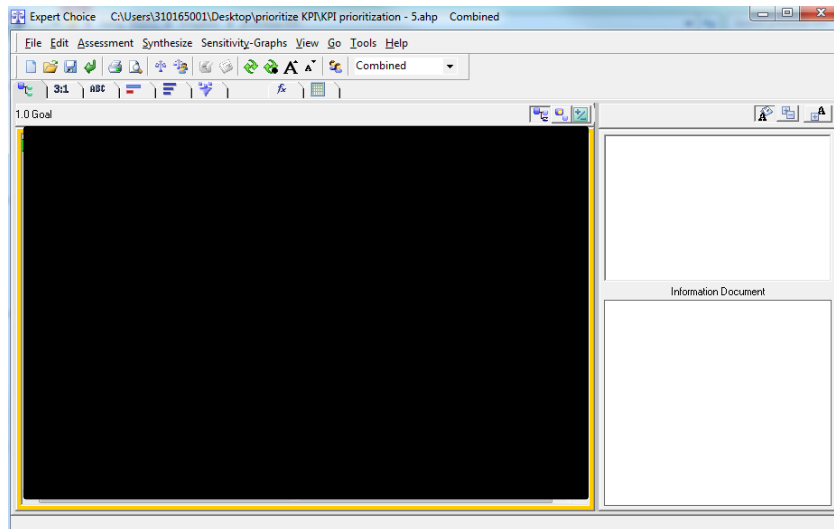
Profit and Sales generation		
Earnings per share (EPS) (€)	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	Reported EBITA (%)
Earnings per share (EPS) (€)	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	ROIC (%)
Earnings per share (EPS) (€)	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	Working Capital (%)
Earnings per share (EPS) (€)	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	Free Cash Flow (%)
Reported EBITA (%)	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	ROIC (%)
Reported EBITA (%)	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	Working Capital (%)
Reported EBITA (%)	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	Free Cash Flow (%)
ROIC (%)	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	Working Capital (%)
ROIC (%)	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	Free Cash Flow (%)
Working Capital (%)	9 8 7 6 5 4 3 2 1 2 3 4 5 6 7 8 9	Free Cash Flow (%)

Category	Item	Description
Category 1	Item 1.1	Description 1.1
	Item 1.2	Description 1.2
	Item 1.3	Description 1.3
	Item 1.4	Description 1.4
	Item 1.5	Description 1.5
	Item 1.6	Description 1.6
	Item 1.7	Description 1.7
	Item 1.8	Description 1.8
Category 2	Item 2.1	Description 2.1
	Item 2.2	Description 2.2
Category 3	Item 3.1	Description 3.1
	Item 3.2	Description 3.2
Category 4	Item 4.1	Description 4.1
	Item 4.2	Description 4.2
	Item 4.3	Description 4.3
Category 5	Item 5.1	Description 5.1
	Item 5.2	Description 5.2
	Item 5.3	Description 5.3
Category 6	Item 6.1	Description 6.1
	Item 6.2	Description 6.2
	Item 6.3	Description 6.3
Category 7	Item 7.1	Description 7.1

[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]

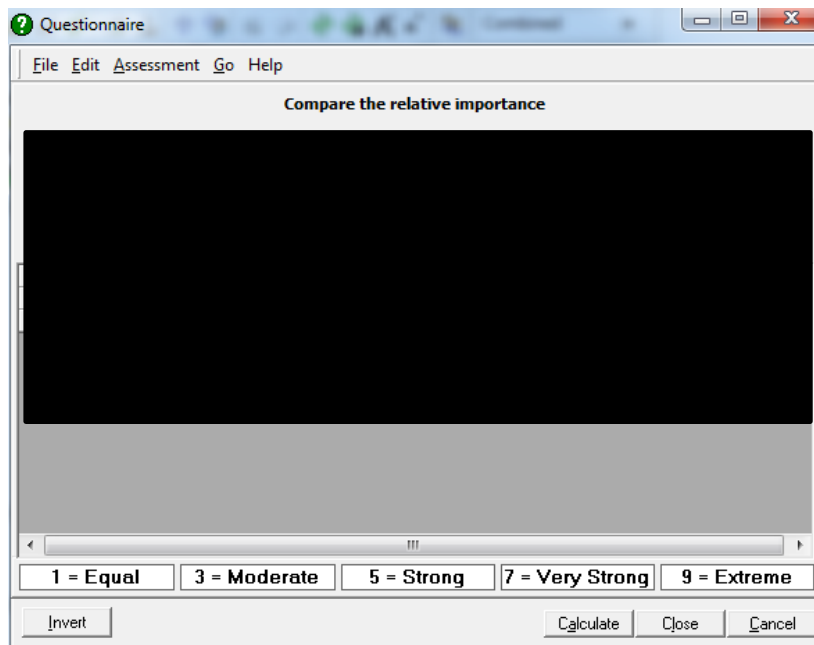
Appendix C

1) Structuring the hierarchy tree in the software.



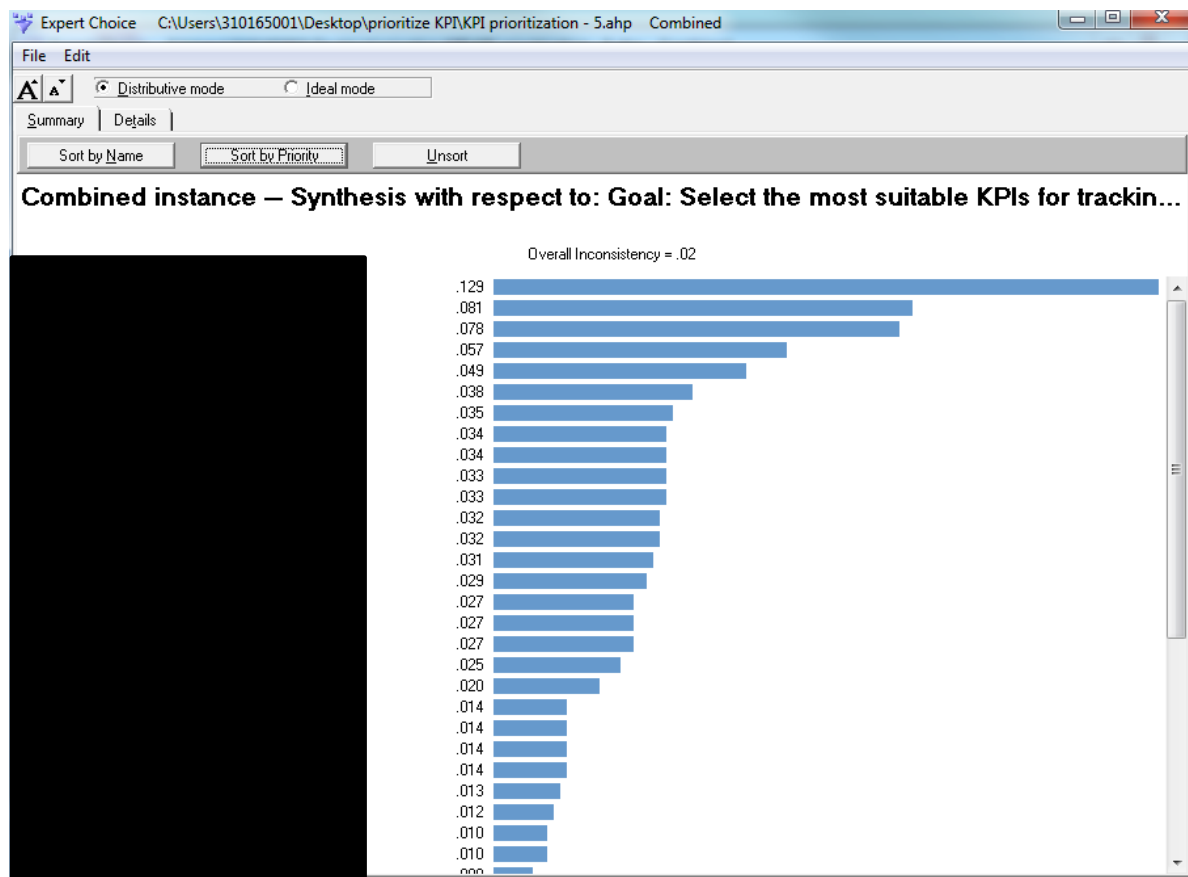
Above figure shows how the hierarchy tree is structured in Expert Choice 11.0. For example, the goal of this prioritization “Select the most suitable KPIs for tracking strategy execution” is structured on the top level. Under the goal, the Group commitments and sub commitments are structured. In order to simplify paired comparisons for decision makers, we rearrange the categorization of KPIs when a sub commitment contains more than 5 KPIs. For example, we categorize 7 KPIs into two groups under sub commitment [REDACTED] based on different business goals. 5 KPIs are in Group 1 [REDACTED] and another 2 KPIs into Group 2 [REDACTED] for paired comparisons.

2) Paired comparison on each hierarchy level



After building the hierarchy tree in the system (Expert Choice environment), results of paired comparisons collected from hard paper questionnaires are entered into the system. Above figure presents an example of the interface of questionnaires in Expert Choice. The setup is the same with a hard paper questionnaire. For example, if a decision maker prefers [REDACTED] is “moderately” more important than [REDACTED] and he/she circled 3 in the hard paper questionnaire. Same answers are entered into the system as well. When all the comparison results are copied from hard paper questionnaires to the system, all questionnaires are combined into a comparison matrix and run the prioritization results.

3) Run the prioritization result



Above figure shows the prioritization results of all commitment KPIs. Based on the inputs of hierarchy tree and paired comparison questionnaires, the system can run the programs and deliver prioritization results per hierarchy level according to AHP approach. The software present results in two modes: distribution mode and ideal mode. “The distribution mode is based on historical AHP approach, which adopts an additive aggregation with normalization of the sum of the local priorities to unity. The ideal mode uses a normalization by dividing the score of each alternative only by the score of the best alternative under each criterion” (Ishizaka, 2009).

Millet and Saaty (2000) provide some guidance on which mode should be chosen for analysis of the results. It is suggested to choose the distribution mode when 1) it is a closed system and no alternative will be added or removed, or 2) it is an open system and preferences for alternatives are allowed to be dependent on other alternatives. It is suggested to choose the ideal mode when it is an open system and no other alternative is expected to affect the outcome (Ishizaka, 2009). The two modes may deliver different ranking results. Because the commitment dashboard in this study is more like a closed system and executives are not willing to add or remove any KPIs at this moment, we choose the distributive mode to show the results.

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