Strategy Process in Higher Education

JUHA KETTUNEN

Turku University of Applied Sciences, Finland

Submitted to *Journal of Institutional Research* April 2010, accepted June 2010

Abstract

Higher education institutions educate those who are the most talented and best able to secure the future for the next generation. This study examines an efficient strategy process in higher education and emphasises the importance of sufficient dialogue during the process. The study describes the strategy process of the Turku University of Applied Sciences in Finland. It describes how web-based dialogue can be used to pass surveillance, mentality and power filters and broaden the ability of management to observe the environment from different perspectives. A web-based strategy dialogue encourages presentation of ideas, enables evaluation of other's ideas and produce topics for further development. The study also discusses how the results of the dialogue can be used to define both strategic objectives and themes using a strategy map. The findings are useful for educational administrators who have the responsibility for strategic planning of higher education institutions.

***Keywords*:** Strategic plan, Balanced Scorecard, dialogue, evaluation, higher education

Successful management of higher education institutions (HEIs) depends on the ability of administrative managers to adapt to a rapidly changing environment. The process entails gathering, analysing, and dispensing both factual and subjective information on the current environment and condition of the organisation. Environmental analysis is the starting point of such strategy process. Periodical analysis is complemented by regular annual scanning of the environment and then appropriate adjustment of action plans. Today's turbulent environment requires continuous scanning, which then allows management to take advantage of opportunities and respond to threats (Temtime, 2004; Tonn, 2008).

Strategic management offers a forward-looking view and produces a description of the route between the perceived present and the desired future (Kettunen, 2004a, 2004b). The strategy process produces a strategic plan and defines strategic objectives. The Balanced Scorecard introduced by Kaplan and Norton (2001, 2004) has been applied in many countries to help institutional management communicate and implement such strategic plans (Chen, Yang & Shiau, 2006; Papenhause & Einstein, 2006; Self, 2003).

The purpose of this study is to describe how a web-based dialogue can help managers of HEIs collect information from the environment during the strategy process, evaluate its significance, and then transform it into the strategic objectives and themes of the Balanced

Correspondence to: Juha Kettunen, Turku University of Applied Sciences, Joukahaisenkatu 3 A, FIN-20520 Turku, Finland. E-mail: Juha.Kettunen@turkuamk.fi

Scorecard. The empirical examination describes the strategy process of the Turku University of Applied Sciences (TUAS), located in Southwest Finland. The process explicitly takes into account the surveillance, mentality, and power filters presented by Ansoff (1984) to collect information from that environment.

This study is organised as follows. First the study presents the strategy process for an HEI and describes environmental scanning as the starting point for the strategy process. Web-based strategy dialogue is used at the TUAS to collect responses for the strategy process. Then the study presents the strategic plan, using the strategy map to describe the specific strategic objectives. Finally, the results of the study are summarised and discussed in the concluding section.

The Strategy Process in Higher Education

The TUAS is a multidisciplinary HEI founded in 1992. The institution has 750 full-time employees and 9,200 students in seven fields of education. Technology, communication and transport, health care and social services, and business and administration are its biggest fields of speciality. The institution offers 35 degree programs for the bachelor's degree and 10 programs for the master's degree. The institution offers coursework mainly in Finnish, but three degree programs are taught in English.

In December 2008 the Ministry of Education imposed a requirement that Finnish HEIs plan regional strategies. The strategy process started at the TUAS in January 2009 with environmental scanning. The strategic plan of the City of Turku was taken into account, because the city is the owner of the TUAS. The TUAS strategic plan must be aligned with essential network strategies and outlines. The Regional Programme for the Regional Council for Southwest Finland was taken into consideration, because the purpose of the institution is to support regional development. In addition, the strategic plan is aligned with national strategies of innovation policy, internationalisation, and adult education for central government.

Figure 1 depicts the precise strategy process at the TUAS, which takes into account the results of a SWOT analysis (strengths, weaknesses, opportunities and threats). The SWOT analysis, credited to Albert S. Humphrey, came from his research at the Stanford Research Institute from 1960 to 1970. It is still a useful and widely used tool for understanding the internal and external factors of an organisation and analysing its situation in the environment (Chang & Huang, 2006; Ghazinoory, Zadeh, & Memariani, 2007; Shinno, Yoshioka, Marpaung, & Hachiga, 2006). This current study shows that the SWOT analysis can be extended using the web-based strategy dialogue developed by Ilmola and Kotsalo-Mustonen (2003).

The outcome of the strategy process is a strategic plan that is put together by the management team of the specific institution and approved by the management board. The strategic plan is based on the strengths of the organisation and exploits the opportunities present in the environment to create a superior position in the market. Both the strategic dialogue and participation in the strategy process are more important than the actual written document, because it is the ongoing process that supports the commitment to the strategic plan.

The Balanced Scorecard was originally developed for use by private companies but, with slight modifications, it can be used in the public sector (Kaplan & Norton, 2001, 2004).

This approach has been designed as a mechanism to make the strategic plan more understandable to both management and personnel, as it translates the strategic plan into strategic objectives, themes, and measures and also balances them in a generic form into customer, financial and internal processes as well as valuable organisational learning perspectives.

The information on the external and internal analyses can be used not only for strategic planning, but also to contribute to raising both internal awareness and motivation for quality improvement. The fitness-for-purpose principle emphasises an environment-oriented approach and considers quality as the fulfilment of a customer's requirements, needs, or desires (Harvey & Green, 1993; Welch & Dey, 2002). Customer information about environment can then be used to assist management with self-evaluation and suggest potential improvements to its quality assurance system.

The action plan, the human resources (HR) plan, the budget, and other plans are then used to implement the precise strategic plan throughout the organisation. The monitoring of these plans is part of the periodic review process of management. The budgets and action and HR plans must be consistently balanced to achieve a consensus for the planning period. The action plan defines strategic objectives, measures and their target values, which must be considered for the various administrative units. The deans and managers are expected to plan the timetables and identify individuals responsible for the planned tasks.

The management information system for the TUAS is an electronic platform that includes the detailed plans and utilises the Balanced Scorecard to integrate both future planning and quality assurance. The operational data systems include the accounting and HR systems and the study and student register. The raw data of these source systems are extracted and transformed to a unified and recognisable form and then loaded to the data warehouse. The data warehouse transforms various source data and provides reliable information to users of the management portal (Kettunen & Kantola, 2005).

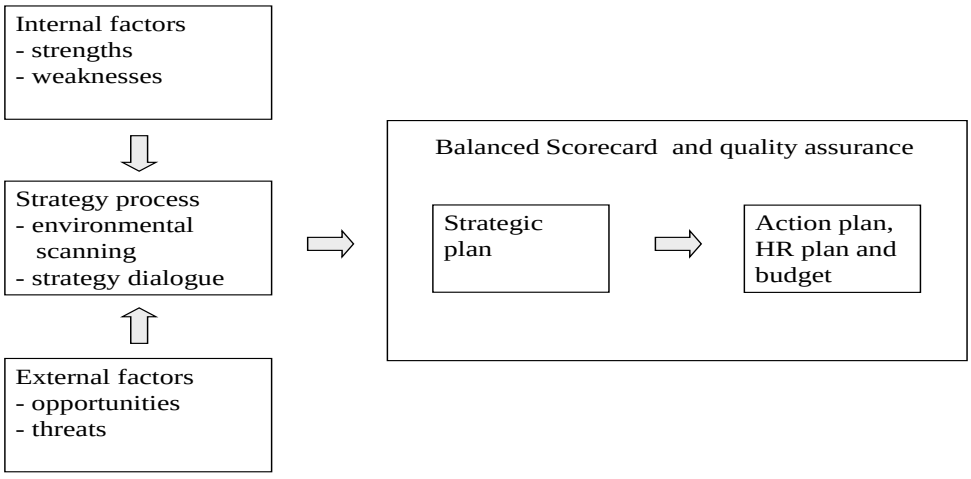

Figure 1: The strategy process from environmental scanning to implementation.

Signals from the Environment

Filters of surveillance, mentality and power

Each organisation must analyse its situation in its own environment, evaluate novel information and weak signals and refine them to fit the strategic plan, which can then be considered to be a shared cognitive scheme (Hendry, 2000). The explicit and implicit mental processes of scanning, framing, and interpreting the environment are essential elements in the sense-making of the strategic situation of the organisation (Weick, 2001). These cognitive frameworks or mental models will frame the way that individuals make sense of and act within their respective environments (Bogner & Barr, 2000).

The capacity and flexibility of organisations to adjust rapidly to environmental changes is necessary to survive and compete. Strategic flexibility is the key competence to capture external information and plan proactive strategies for promoting innovations and taking action to respond to a changing environment (Sanchez, 2002). An important challenge for managers then is to take full advantage of the knowledge within and outside the organisation (Takeuchi & Nonaka, 2004). Managers need to collect the information, evaluate its significance, transform it to a strategic plan, and finally communicate and implement that plan.

According to Ansoff (1984), signals from the environment must pass three filters: surveillance, mentality, and power. The surveillance filter blocks the information that is out of the sight and scope of an individual. The mentality filter reduces the amount of information from the environment and limits individuals to seeing only the short-sighted changes in time. The power filter blocks information from other organisational levels and strong organisational cultures. The organisational units, managers, or experts may decide to ignore vital information, if their importance is reduced. In every filter, some information will be blocked out, and the rest then passes through the filter. Therefore, it is essential to use techniques that can capture the most essential information from the environment.

An obvious way to open the surveillance filter is to increase the diversity of participants in that observation. The identities of and differences among personnel, partners, and students will broaden the scope of observation. The scope of briefing is thus essential for the surveillance filter. A less restrictive briefing usually produces more diversity, but more of the responses will be irrelevant. Therefore, it is important to attach the briefing to the main activities or mission of the organisation. The development of the mentality with management education can help managers see broader opportunities. An uncommon environment, informal situation, and relaxing of argumentation can be used to broaden the mentality filter. The power filter can be opened by having anonymity of participants in the process. In addition, multiple opinions are more likely when the strategy process is long enough and decisions are made at a later stage in the process.

A web-based dialogue was designed to collect, evaluate, and analyse signals from personnel, organisational partners, and students to take into account the surveillance, mentality and power filters. That method has been described in detail in the study by Ilmola and Kotsalo-Mustonen (2003). Minimal surveillance and power filters are used to collect the signals so that anonymous respondents come from heterogeneous groups and select the issues they put forward in a form they prefer. The mentality filter is opened by observing and evaluating signals from other respondents who do not need to argue their views. The power

filter is kept open by the analysing group, which treats all signals as equal and explicates the potential of weak signals up to the later stage of the analysis.

Teachers and other experts have the power to subvert, constrain, or ignore changes that they do not accept. Without actively engaging the members of the organisation in the strategy process, a successful outcome is unlikely. Altogether, 453 people participated in the web-based dialogue. The web-based dialogue produced 1,898 ideas, and that dialogue allowed respondents to comment on suggestions obtained from others. The commenting on responses from many perspectives can reveal weak signals, which can then anticipate changes and provide strategic opportunities (Coffman, 1997). The perceptions of teachers and students are essential in evaluating the quality of education (Williams & Cappuccini-Ansfield, 2007; Viswanadhan, 2009).

Evaluation of present activities

A web-based dialogue was used in the first phase to evaluate the present activities of the institution that linked with its mission. The respondents were asked to evaluate its strengths and weaknesses based on their personal experiences. The main activities include education, research, and development (R&D), internationalisation, and regional development. This phase produced 587 strengths and 551 weaknesses. Text mining was used to conduct a content analysis and transform a large amount of textual data into classified topics, using the text mining tool DR-TextMiner, as described in the study by Merisalo-Rantanen, Rossi, Hallikainen and Nurmimäki (2009).

The strengths of education and support services are knowledge of personnel, connection with working life, content of education, and facilities. The respondents emphasise the pedagogical methods that they use to help students to see the theoretical aspects and the applications that they need in a working life. The weaknesses are insufficient resources, meagre teacher skills, deficient collaboration with working life, weak study guidance and support services, inadequate degree programs, and poor skills of enrolled students. It is typical in these kinds of surveys that some matters are considered as both strengths and weaknesses at the same time, thus reflecting the respondents' heterogeneous views and opinions.

The strengths of R&D are collaboration, skills, resources and facilities, the enthusiasm of personnel, publications, and student collaboration. The strength of the institution is the amount of its external funding, which is the largest in the Finnish universities of applied sciences. The weaknesses are scarce resources, insufficient motivation and knowledge of personnel, low number of publications, insufficient collaboration, and low reputation.

The strengths of international activities are the students' exchanges, networked collaboration, language skills, and competent international personnel. The TUAS has more than 200 collaborating institutions abroad and there are plenty of ongoing international development programs with other HEIs. In addition, the student exchange is active. Weaknesses are the organisation of exchanges, insufficient language skills, insufficient networked collaboration, and resources. Of these activities, there are clearly different views and opinions.

The strengths of regional development are collaboration with companies, municipalities, schools, and other HEIs. The production of a skilled labour force in the region

is considered important and supported by the fact that most graduates find employment in the region. The weaknesses are insufficient reputation, collaboration, and resources. The respondents believe that the brand of the institution is weak and more communication and marketing is needed to strengthen the visibility of the institution.

Table 1 depicts the evaluation results for the present activities of the TUAS. A great majority of respondents emphasise the importance of education, but fewer emphasise the role of R&D. Quite a large share of people strongly agree that the institution is truly international due to the fact that student and personnel exchange is large and there are plenty of international R&D projects. The respondents also emphasised the importance of regional development.

Table 1

Evaluation results for present activities of the institution

	Strongly disagree %	**Disagree %**	**Neutral %**	**Agree %**	**Strongly agree %**
'Education and support services have been geared to serve learning'	0.6	9.6	22.6	63.3	4.0
'Applied research and development are our mission'	3.2	10.9	28.2	52.6	5.1
'Our institution is truly international'	0.6	9.6	23.6	54.1	12.1
'We contribute to regional development'	0.6	7.4	22.2	59.9	9.9

Ideas for a better future

The purpose of this dialogue was to involve a large number of people in planning for the future, collecting information about the opportunities and threats facing the institution and identifying new ideas for development. The web-based dialogue produced 281 original ideas without any stimulus. The other respondents then evaluated these ideas and presented new ones, which raised the amount of new ideas to 428. Finally, the importance of the ideas that were produced was evaluated on a scale of 1 to 10. Any disagreement between ideas was evaluated using the standard deviation.

Figure 2 presents the suggested ideas for the strategic plan acquired from web-based dialogue grouped into topics for development by importance and standard deviation. The size of the ball in the figure reflects the share of topics. The ideas relate to a general question on how the institution can improve its position in its environment. Text mining was used to transform textual data into classified topics. Web-based dialogue is only one method used in the strategy process, thus the grouped topics were collected along with other information regarding the strategic objectives and themes of the strategic plan.

Most of the ideas submitted for consideration during the web-based dialogue addressed students. Written opinions suggested ways for personnel to take the wishes and hopes of students more into account and increase their general welfare. Recruitment of students was considered an important factor for quality control. The respondents emphasised the responsibility and active participation of students in all activities of the institution. Teaching received many proposals, especially on issues concerning financial resources,

content and quality of education, innovative teaching methods, and collaboration with working life.

Knowledge, or the question of how to take advantage of the knowledge embodied in the personnel and how to develop their skills – especially in research, development, and international activities – received many ideas. Knowledge should meet the needs of students and the region where education is targeted. Working life was considered the most important group of ideas, emphasising the importance of customer-oriented activities. These ideas stressed both contacts and collaboration of teachers and students with working life.

The suggested ideas concerning teachers and other personnel pertained to the welfare of teachers and students, the development of teaching skills, the appreciation of teaching and the development of the payroll system. Resources and financing received plenty of attention and were concerned with the allocation of resources in teaching. There were many suggestions that more resources from the Ministry of Education should be allocated to teaching, but some respondents also emphasised cost-efficiency.

Respondents viewed collaboration within the institution and between institutions, schools, working life, and partners as important. Ideas regarding degree programs emphasised multidisciplinary cooperation, especially in R&D where project work and education collaborate to meet important regional development needs. The ideas for R&D emphasised sufficient funding, knowledge, and collaboration between the institution and working life. There were also comments about internationalisation, but surprisingly these activities were considered less important than the others mentioned. Internationalisation emphasises the importance of project collaboration and international exchange of students and teachers.

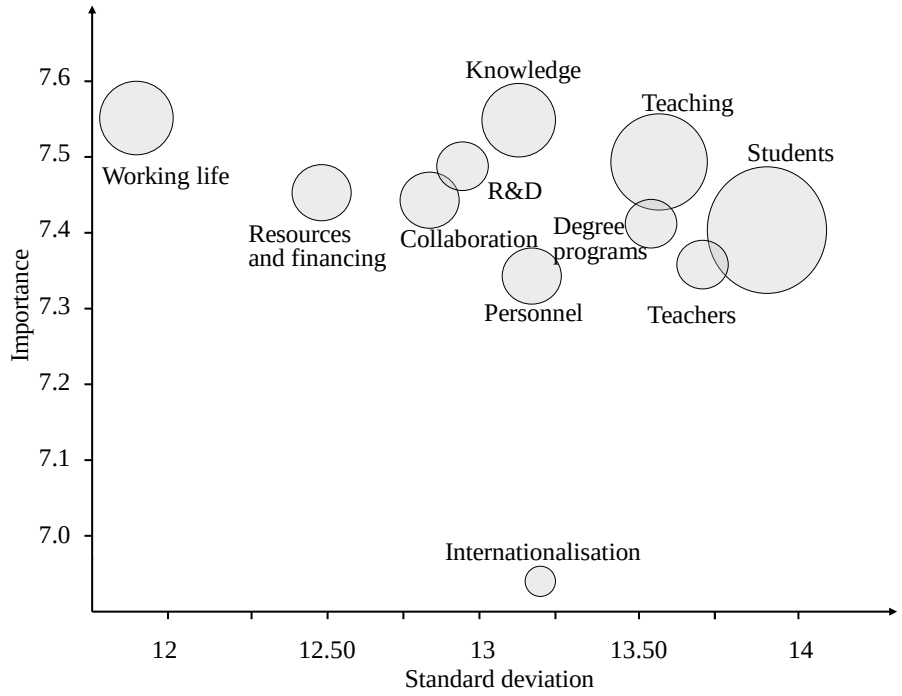

Figure 2: Topics for the strategic plan from web-based dialogue.

Face-to-face dialogue

The management board of the TUAS was provided with management education to broaden its thinking. The management board arranged a strategy seminar for participants from the retail business, construction industry, information and communication industry and the Confederation of Finnish Industries. This environmental analysis took into account both national education policy and local demand for skilled labour. Following these phases, top management presented the environmental analysis, web-based survey and preliminary strategic outlines to their personnel.

The management team of the institution analysed the results obtained from the face-to-face dialogue and allocated the results of the strategy process to strategic themes that describe what management believes is needed to succeed and achieve the identified strategic outcomes (Kaplan & Norton, 2001). The results of the strategy process were collected in the strategic plan and strategy map. The most important stakeholders were asked for statements on the strategic plan, after which the management board approved the plan in September 2010.

Many of the suggested ideas were not included in the strategic plan, because they were not relevant to the overall strategic plan of the institution. Instead, several of these development ideas were placed in the action plan of the institution, faculty, or other organisational unit. These plans were then scheduled for implementation between 2010 and 2013 and will be annually updated when necessary. The action plans are then annually negotiated between top management and faculties in internal target negotiations and aligned with budgets.

Strategic Plan

Strategic management requires a clear sense of explicit direction. The desirable future state of the organisation is expressed by a vision, which should be shared by all members of the organisation. The purpose of the management team was to write an energising, clear, and easy-to-understand vision statement. The vision statement of the TUAS was written to read as follows: ‘The Turku University of Applied Sciences is a world-class higher education institution which increases the competitiveness and welfare of Southwest Finland’.

Any vision is based on the experience, knowledge, hopes and dreams of top management and personnel. Leadership can be seen as the art of mobilising others to struggle for shared strategic objectives and vision.

Strategic plans are often long documents wherein it is difficult to identify the key issues to achieve success and find the route to meet an institutional vision. The strategic themes for the TUAS are as follows:

- innovation pedagogy and lifelong learning
- international education and research and development
- internationally recognised knowledge
- partnerships to strengthen external funding
- activities targeted to meet the needs of Southwest Finland
- research and development to support the regional innovation system.

These concise strategic themes allow management to perceive and communicate all the essential elements of the strategic plan.

The Balanced Scorecard has been used successfully in higher education to help management communicate and implement their strategic plans (Beard, 2009). Regional development relevant to the local community, students, and employers can be placed in the customer perspective. The customers in the public sector receive the service while another group, the tax payer, typically provides the financial resources for the services. Therefore, it is reasonable to place the recipient of such services or the customer at the top of these perspectives, because financial results are not the primary objective for most of non-profit organisations in the public sector (Askim, 2004; Moullin, 2009).

Figure 3 uses the concept of the strategy map (Kaplan & Norton, 2004) to describe the perspectives, strategic objectives, and strategic themes of the TUAS. The strategy map is a graphical representation of that strategic plan and also describes the causal linkages between the perspectives and the strategic objectives to help management communicate the strategy to both personnel and stakeholders in a concise and understandable manner (Kettunen, 2006a, 2006b, 2008). Like a road map, the graphical representation illustrates only the main characteristics of the strategy, leaving out the minor details.

The regional development and customer satisfaction perspective is limited to the strategic objectives for ‘regional development’ and ‘customer satisfaction’. These objectives are described by lagging indicators in the Balanced Scorecards and outcomes, which are the results of the activities described in the internal processes. In the public sector, it is reasonable to place the customer at the top of the hierarchy; whereas in business, meeting the company’s financial objectives is often the desired outcome.

The financial perspective includes those strategic objectives related to ‘funding from central government’, supplemented by the objectives of ‘external funding’ and ‘cost-efficiency’. These financial objectives are aligned with the internal processes in the annual budgeting process. Since cost-efficiency has been a strategic objective since 2000, the TUAS administration is the most cost-efficient of all the Finnish universities of applied sciences according to statistics provided by the Finnish National Board of Education.

The internal processes perspective includes the three strategic objectives of ‘teaching and learning’, ‘R&D’, and ‘internationalisation’. These internal processes, as described in the strategy map, are only a summary of all the processes of the TUAS, which has more than 100 detailed process descriptions in its quality assurance system applying the concepts of business process modelling (Jeston & Nelis, 2006, 2008). Even though all of these processes are important, they lack the strategic importance for a better future that is described in the strategy map.

The organisational learning perspective includes three strategic objectives of ‘teacher capabilities’, ‘R&D capabilities’ and ‘international capabilities’, which are the drivers for efficient internal processes. The annual HR plan describes these objectives in detail. In many information-age organisations, HR may be even more important than financial assets.

The exact strategic themes are headlines in the strategic plan and written out in the strategy document. The managers who are responsible for operational management must drill the strategic themes down to action plans and include these plans in their operating budgets and HR plans. The action plan identifies the individuals who are responsible for the

operations, timetables, and budgets. The action plan includes the measures (indicators) from the Balanced Scorecard, which describes the achievement of all the strategic objectives.

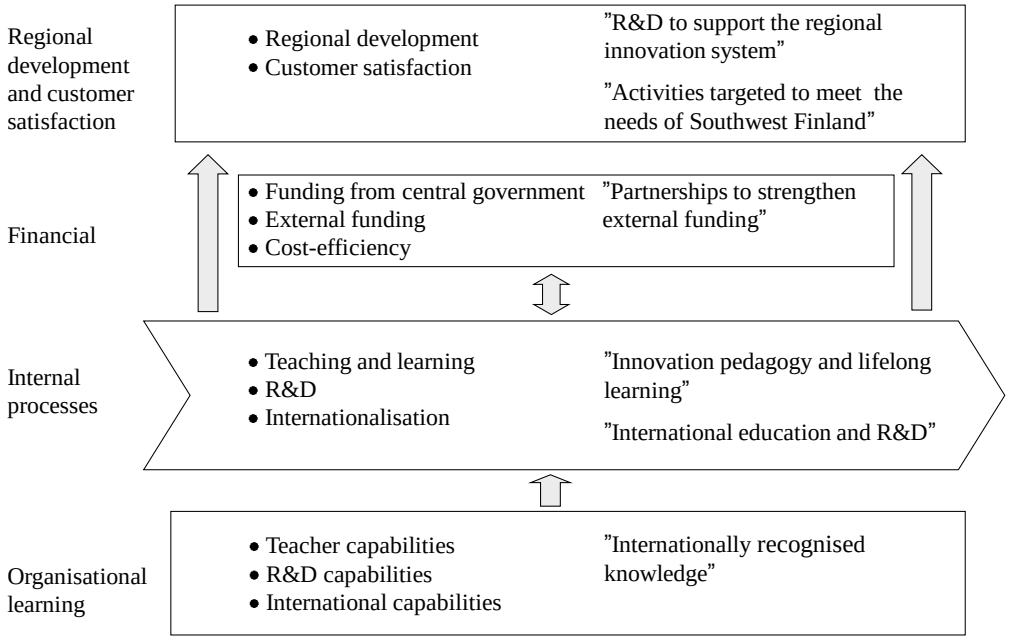

Figure 3: Strategy map for the Turku University of Applied Sciences.

The purpose of the strategy process is to produce a strategic plan for a better future. It is important that the members of the organisation are committed to that strategic plan. The strategy process can be enhanced by having efficient dialogue. A web-based dialogue was thus designed in this study to collect, evaluate, and analyse ideas and opinions of the stakeholders. The web-based dialogue does not produce large amounts of numerical data, but it is essential that this textual data can be evaluated and collected into topics to plan a better future.

Web-based dialogue is important because it will pass surveillance, mentality and power filters that may reduce or block necessary information that should be taken into account in the strategy process. The web-based dialogue produces topics that can be discussed in the face-to-face dialogue with members of the organisation. That process leads to the strategic objectives and themes described and noted in the strategic plan. Minor ideas and short-term development steps can then be included in the annual action plans of the institution.

The strategy map of the Balanced Scorecard approach makes strategic objectives visible and more understandable than they would be in longer written strategy documents. The strategy map clearly describes the strategic objectives and the causal linkages between those objectives. Quality assurance should be geared to strategic management. The quality assurance system of the institution can thus ensure that the strategic objectives of the institution are achievable.

References

Ansoff, I. (1984). *Implanting strategic management*. Englewood Cliif, NJ: Prentice Hall International.

Askim, J. (2004). Performance management and organizational intelligence: Adapting the Balanced Scorecard in Larvik municipality. *International Public Management Journal, 7*(3), 415–438.

Beard, D.H. (2009). Successful applications of the Balanced Scorecard in higher education. *Journal of Education for Business, 84*(5), 275–282.

Bogner, W.C., & Barr, P.S. (2000). Making sense in hypercompetitive environments: A cognitive explanation for the persistence of high velocity competition. *Organizational Science, 11*(2), 212–226.

Chang, H.H., & Huang, W.C. (2006). Application of a quantification SWOT analytical method. *Mathematical and Computer Modelling, 43*(1–2), 158–169.

Chen, S.H., Yang, C.C., & Shiau, J.Y. (2006). The application of Balanced Scorecard in the performance evaluation of higher education. *The TQM Magazine, 18*(2), 190–205.

Coffman, B. (1997). *Weak signal® research, Part IV: Evolution and growth of the weak signal to maturity*, MG Taylor Corporation. Retrieved April 11, 2010, from http://www.mgtaylor.com/mgtaylor/jotm/winter97/wsrmatur.htm

Ghazinoory, S., Zadeh, A.E., & Memariani, A. (2007). Fuzzy SWOT analysis. *Journal of Intelligent & Fuzzy Systems: Applications in Engineering and Technology, 18*(1), 99–108.

Harvey, L., & Green, D. (1993). Defining quality. *Assessment and Evaluation in Higher Education, 18*(1), 9-34.

Hendry, J. (2000). Strategic decision making, discourse and strategy as social practice. *Journal of Management Studies, 37*(7), 955–977.

Ilmola, L., & Kotsalo-Mustonen, A. (2003) Filters in the strategy formulation process. *Journal of Universal Computer Science*, *9*(6), 481–490.

Jeston, J., & Nelis, J. (2006). *Business process management*. Amsterdam: Elsevier.

Jeston, J., & Nelis, J. (2008). *Management by process*. Amsterdam: Elsevier.

Kaplan, R., & Norton, D. (2001). *The strategy-focused organization*. Boston, MA: Harvard Business School Press.

Kaplan, R., & Norton, D. (2004). *Strategy maps*. Boston, MA: Harvard Business School Press.

Kettunen, J. (2004a). Bridge building for the future of the Finnish polytechnics. *Journal of Higher Education Outreach and Engagement, 9*(2), 43–57.

Kettunen, J. (2004b). The strategic evaluation of regional development in higher education. *Assessment & Evaluation in Higher Education, 29*(3), 357–368.

Kettunen, J. (2006a). Strategies for the cooperation of educational institutions and companies in mechanical engineering. *The International Journal of Educational Management, 20*(1), 19–28.

Kettunen, J. (2006b). Strategic planning of regional development in higher education. *Baltic Journal of Management, 1*(3), 259–269.

Kettunen, J. (2008). A conceptual framework to help evaluate the quality of institutional performance. *Quality Assurance in Education, 16*(4), 322–332.

Kettunen, J. & Kantola, I. (2005). Management information system based on the Balanced Scorecard. *Campus-Wide Information Systems, 22*(5), 263–274.

Merisalo-Rantanen, H., Rossi, M., Hallikainen, P., & Nurmimäki, K. (2009). User influence in e-service evolution: A case study of e-banking. *Communications of the Association for Information Systems, 24*, Article 41. Retrieved April 11, 2010, from http://aisel.aisnet.org/cais/v0124/iss1/41

Moullin, M. (2009). Public sector scorecard. *Nursing Management–UK, 16*(5), 26–31.

Papenhause, C., & Einstein, W. (2006). Implementing the Balanced Scorecard at a college of business. *Measuring Business Excellence, 10*(3), 15–22.

Sanchez, R. (2002). Understanding competence-based management, Identifying and managing five modes of competence. *Journal of Business Research, 57*(5), 518–532.

Self, J. (2003). From values to metrics: Implementation of the Balanced Scorecard at a university library. *Performance Measurement and Metrics, 4*(2), 57–63.

Shinno, H., Yoshioka, S., Marpaung, S., & Hachiga, S. (2006). Qualitative SWOT analysis on the global competiveness of machine tool industry. *Journal of Engineering Design, 17*(3), 251–258.

Takeuchi, H., & Nonaka, I. (2004). *Hitotsubashi on knowledge management*. Singapore: John Wiley & Sons.

Temtime, Z.T. (2004). Linking environmental scanning to total quality management through business planning. *Journal of Management Development, 23*(3), 219–233.

Tonn, B.E. (2008). A methodology for organizing and quantifying the results of environmental scanning exercises. *Technological Forecasting & Social Change, 75*(5), 595–609.

Viswanadhan, K.G. (2009). Quality problems of engineering education programmes in India. *International Journal of Management in Education, 3*(1), 40–55.

Weick, K.E. (2001). *Making sense of the organization*. Oxford: Blackwell Publishers.

Welch, J.F., & Dey, S. (2002). Quality measurement and quality assurance in higher education. *Quality Assurance in Education, 10*(1), 17–25.

Williams J., & Cappuccini-Ansfield, G. (2007). Fitness for purpose? National and institutional approaches to publicising the student voice. *Quality in Higher Education, 13*(2), 159–172.