

# IMPLEMENTING SUSTAINABLE COMPETITIVE ADVANTAGE TO THE PUBLIC SECTOR'S MANAGEMENT SYSTEM – BY SENSE AND RESPOND METHODOLOGY IN FACILITIES SERVICES UNIT'S PREPAREDNESS

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**ABSTRACT**

How to ensure that the various levels of the organization are operating in accordance with a common strategy? According to the Hallberg committee's Preparedness and comprehensive security report [1] the key challenges the public sector organization faces lies in finding new ways of operating horizontally across various levels of administration. This paper aims to develop the preparedness in the target organization by strategy's resource-based identification for implementing sustainable competitive advantages to the public sector's management system. The research methods used are a case study and surveys, which were connected by the analytical hierarchy process based form and two sense and respond (S&R) based forms. The longitudinal data for the surveys were collected in two phases and analyzed with the balanced critical factor index method [2] and transformational leadership indexes (TLI) with technology levels [3]. The BCFI & TLI method identifies and clarifies the unit's development and risk factors. According to [4] during the process of sense and respond, it is important to develop an operational strategy adjustment system by utilizing critical factor evaluation. As [5] describes in her dissertation if there were clear goals defined for the quality of the (public) services the natural choice of the approach in the purpose of evaluation for accountability would be the goal-attainment evaluation. The innovative findings lay the groundwork for the decision makers to focus efforts and readjust the operations of the target organization in order to achieve operational sustainable competitive advantage (OSCA).

**KEYWORDS**

operational sustainable competitive advantage (OSCA), operational competitiveness, operations strategy, sense and respond (S&R), balanced critical factor index (BCFI), public sector, facilities services, preparedness.

## Introduction

Research topic, implementing sustainable competitive advantage to the public sector's management system, is a combination of author's work in the public sector and Industrial Management studies in the University of Vaasa's Faculty of Technology. Author started working in 2002 as technical director in a small municipality. In 2009, he moved to the current

employer, the city of center of South Ostrobothnia region, to working as maintenance manager and preparedness liaison officer. These jobs have in common is the operations management, identify, develop and use resources for society to secure its performance under all conditions. According to the personal work history in the small and medium size public organizations in three regions at Western Finland they have same challenges. Internal control and evaluation

methods seem to be more an outline than accurate system to take effective development steps for same direction in every level of the organization. The lack and vagueness of common goals in the strategy forms a fog for operations. But until now the tools for effectively managing the links between operations design and leading to achieve sustainable competitive advantages to multi-level organization, have not been available.

## Methods

### AHP, questionnaires, data collection and analysis

Analytic Hierarchy Process (AHP) method is a decision instrument that allows considering quantitative and/or qualitative measures [6]. The using of AHP in the case is as follows. The first step is to do the model of hierarchy structure for the goal. This study tests the manufacturing strategy from [7] and transformational leadership from [8] are constructed, and these serve as the theoretical framework. The second step is the comparison of the alternatives and the criteria. They are pairwise compared with respect to each element of the next higher level. The third step is connecting the comparisons to obtain the priorities of the alternatives with respect to each criterion and the weights of each criterion with respect to the goal. The local priorities are then multiplied by the weights of the respective criteria. The results are summed up to get the overall priority of each alternative. To do that in this study used software is Expert Choice's EC11.5 AHP software program and Microsoft's Microsoft Office Excel 2010 spreadsheet software program. The data of case are collected in the same manner: by asking interviewees to answer the questionnaires from different level of the target organization. The interviewees have to have good knowledge about the operations of the case organization. In this case study informants were workers, supervisors and maintenance manager of the facilities services unit. The workers and supervisors are trained to understand every item of the questionnaires correctly by interview and author. After they finish the questionnaires, the answers are analyzed with AHP software. The discussion with the audit manager and rescue director reveals the results and verifies the validity and reliability of the data further. Inconsistency ratio (icr) was smaller than 0.1 which assure internal validity.

### CFI, Sense and respond

In the study, the Sense and Respond [9] model proposed by [10] is used for the empirical research.

The critical factor index (CFI) method is a measurement tool to indicate which attribute of a process is critical and which is not, based on the experience and expectations of the interviewees. The calculations are bases formulas (1), (2), (3) and (4), as shown below.

$$I_{Imp} = \bar{x}_{Ep}/10, \quad (1)$$

$$I_{Gap} = |(\bar{x}_{Er} - \bar{x}_{Ep})/10 - 1|, \quad (2)$$

$$I_{DoD} = |(C_B - C_W)/100 - 1|, \quad (3)$$

$$I_{CF} = \frac{s_{Ep} \times s_{Er}}{I_{Imp} \times I_{Gap} \times I_{DoD}}. \quad (4)$$

### Parameters

$\bar{x}_{Ep}$  – mean of expectations,

$\bar{x}_{Er}$  – mean of experiences,

$s_{Ep}$  – standard deviation of expectations,

$s_{Er}$  – standard deviation of experiences,

$C_B$  – better performance than expected,

$C_W$  – worse performance than expected,

$I_{Imp}$  – importance index,

$I_{Gap}$  – gap index,

$I_{DoD}$  – direction of development index, percent values,

$I_{CF}$  – critical factor index.

### Manufacturing strategy

The analytical models for manufacturing strategy are used to calculate the operational competitiveness indexes of companies in different competitive groups, namely prospector, analyzer and defender [11]. The responsiveness, agility and leanness (RAL) holistic model supports the theory of analytical models using four main criteria, i.e. quality, cost, time and flexibility. These analytical models have good transferability to any other organization [12].

According to [13], the manufacturing strategy index (MSI) is modelled based on the multi-criteria priority weights of  $Q$  (Quality),  $C$  (Cost),  $T$  (Time/delivery) and  $F$  (Flexibility), as function:

$$MSI = \int MSI(Q, C, T, F).$$

The equations to calculate normalized weights of core factors are as follows.

$$Q' = \frac{Q}{Q + C + T},$$

$$C' = \frac{C}{Q + C + T},$$

$$T' = \frac{T}{Q + C + T},$$

$$F' = \frac{F}{Q + C + T + F},$$

$Q$  – quality,  
 $C$  – cost,  
 $T$  – time/delivery,  
 $F$  – flexibility.

The analytical models to calculate the manufacturing strategy indexes of operational competitiveness in each group are as follows:

The MSI model for prospector group:

$$MSI_P = 1 - \left(1 - Q^{1/3}\right) * \left(1 - 0.9 * T'\right) * \left(1 - 0.9 * C'\right) * F'^{1/3}.$$

The MSI model for analyzer group:

$$MSI_A = 1 - \left(1 - F'\right) * \left(\text{abs}\left(\frac{(0.95 * Q' - 0.285) * (0.95 * T' - 0.285)}{(0.95 * C' - 0.285)}\right)\right)^{1/3}.$$

The MSI model for defender group:

$$MSI_D = 1 - \left(1 - C'^{1/3}\right) * \left(1 - 0.9 * T'\right) * \left(1 - 0.9 * Q'\right) * F'^{1/3}.$$

### Transformational leadership with technology level

To analyze manager personal affection and employee's expectation in the leadership this case study uses transformational leadership indexes. This holistic model of a human being from resource allocations to behavior and finally to outcome directions and outcomes has been built based on psychic, social, functional, organizational and structural factors and put together according to the sand cone model and participation objectives in leadership of an organization [3].

The theoretical frame of the analytical models is based on the theory of transformational leadership [15] and a modified sand cone model by integrating technology level into part of the resources is proposed in [14]. Based on the analytical models for transformational leadership, these are further developed by integrating technology into resources for the evaluation of leadership indexes and outcomes of transformational leadership.

The analytical models for evaluation of leadership are as follows.

Outcome index (OI):

According to Liu & Takala (2009b: 13), different categories of outcome indexes all lead to nearly the same total leadership indexes, therefore this empirical research uses OI model without classification:

$$OI = 1 - \max\left\{\left|\frac{1}{3} - EE\right|, \left|\frac{1}{3} - SA\right|, \left|\frac{1}{3} - EF\right|\right\}.$$

The categorized OI models (Takala, Kukkola & Penanen 2008; 2009) are provisional and will be explored more in future research.

The OI model for prospector group:

$$OI_P = 1 - \left(1 - EE^{1/3}\right) \times \left(1 - EF\right) \times \left(1 - SA\right) \times \text{Std}\{EE, SA, EF\}^{1/3}$$

where  $EE \geq 0.43$  and  $EF + SA \leq 0.57$ .

The OI model for analyzer group:

$$OI_A = 1 - \left(1 - SA^{1/3}\right) \times \left(1 - \text{Std}\{EE, SA, EF\}^{1/3}\right),$$

where  $SA \geq 0.43$  and  $EE + EF \leq 0.57$

The OI model for defender group:

$$OI_D = 1 - \left(1 - EF^{1/3}\right) \times \left(1 - EE\right) \times \left(1 - SA\right) \times \text{Std}\{EE, SA, EF\}^{1/3},$$

where  $EF \geq 0.43$  and  $EE + SA \leq 0.57$ .

The OI model for reactor group:

$$OI_R = (OI_P + OI_A + OI_D) \div 3,$$

where  $EE < 0.43$  and  $SA < 0.43$  and  $EF < 0.43$ ,  $EE$  extra effort,

$SA$  – satisfaction,

$EF$  – effectiveness.

Leadership index (LI):

$$LI = DL \times \left(1 - \max\{PL, CL\}\right) \times \left(1 - \left|\frac{1}{4} - \max\{IC, IM, IS, BT\}\right|\right),$$

$DL$  – deep leadership,

$PL$  – passive leadership,

$CL$  – controlling leadership,

$IC$  – individualized consideration,

$IM$  – inspirational motivation,

$IS$  – intellectual stimulation,

$BT$  – building trust and confidence.

Resource index (RI) integrating with Technology index (TI):

$$RI = (1 - PT \times (1 - TI)) \times (3 \times \min\{PC, IT, OR\} \times TI)$$

$PT$  – people, technology and know-how,

$PC$  – processes,  $IT$  – information systems,

$OR$  – organizations (groups, teams)

$$TI = 1 - \max\{|SH_{optimal} - SH|, |CR_{optimal} - CR|, |BS_{optimal} - BS|\}$$

*SH* – spearhead technology,  
*CR* – core technology,  
*BS* – basic technology.

Combined total leadership index (TLI):

$$TLI = OI \times LI \times RI.$$

It is proposed to model the overall competitiveness index (OCI) as the function:

$$OCI = f_{OCI}(f_{MSI}, f_{TLI}) = f_{MSI} \times f_{TLI} = MSI \times TLI$$

According to Liu & Takala (2009b: 14), in some cases the OCI can be modelled as the reduced function:

$$OCI = f_{OCI}(f_{MSI}, f_{TLI}) = f_{MSI} \times f_{TLI} \\ = MSI \times OI \times TI.$$

### Implementing sustainable competitive advantage to the public sector's management system

According to [4] the key idea of implementing SCA is by measuring all the time MSI, TLI including OI, LI, RI, TI, and through S&R to find the critical factors in resource allocation and make improvements in the lower level foundations, which in turn helps to make dynamic adjustments based on the changing business situations to improve the upper level strategies. To implement SCA into management system it is important to describe the target organization.

*The public sector has many special characteristics which affect essentially how it is suitable to taking account of developing the processes or products produced by the public organizations [5]. According to [16] the public sector differs from the private sector among others as follows:*

*The operation is directed by the objectives related to social policy.*

*The operation is regulation bound.*

*The operation is budget bound.*

*The organization structure is often multi-level because the public services are nationally directed.*

*The administration and control of public services are managed with several different branches of administration which is why the service structures have segmented and have specialized inside both the government and the municipalities.*

From the properties follows that communal objectives are central the public organization's operations and that the operation is directed from the needs of the whole society. On the other hand, this will offer an advantage for the developing when the

above mentioned factors are taken into consideration. On the results of the developing of one single unit it is preconditions to enlarge and apply to the whole public sector. According to [5] key aspects of the multi-level organization's service production are access to information, levels of the organization are in relation to each other in the service chain and the upper levels of the organization support the lower. Oulasvirta describes the different levels of the public administration in general and characterizes their opportunities to get information for example about the quality of the service.

The target organization is a part of wider public sector organization – although is the one which can compared to producers in a Customer-Producer Model [17]. There are many such models [18] and criticism against them as well (e.g. Vesterinen) [19]. Duality of the model is based on the By-Laws and an inner role in the City of Seinäjoki, its Environment and Technical Infrastructure Service Center. The target unit represents a local authority too and is not separated from the division [17]. Still, the unit's operations strategy needs to be parallel with major stakeholders in the City of Seinäjoki, its Strategy's, By-Laws and Directives [20–24].

According to the Emergency Power Act's (2011/1552 & 1991/1080) [25–26] municipalities shall ensure, by means of emergency plans, prior preparation of emergency operations and other measures, that their duties will be performed with the least amount of disruption also in emergency conditions. At 20 years operations focus has been moved from extremely unusual emergency conditions to common incidents in the normal situations [27–28]. Possibilities to face a turbulent situation have risen. Need for proactive operations have risen [29]. Demands for public services have dramatically changed too. Restructuring of the public sector creates expectations for producing services and monitor service quality. Meaning and value of the “some other one's resources” is not same any more either. According to Virta differences have to recognize and identify common [30]. Therefore implementing SCA to public sector's management system needs investigation in every level – the effects of operation, leadership, technology and examine its transformational capabilities to sustain and develop the overall competitiveness potential of an organization.

## Results

Figure 1 demonstrates the comparison between the experiences and expectations of the respondents.

The attributes with the biggest gap between experience (past) and expectation (future) are the strongest ones.

Expectations vs. Experiences

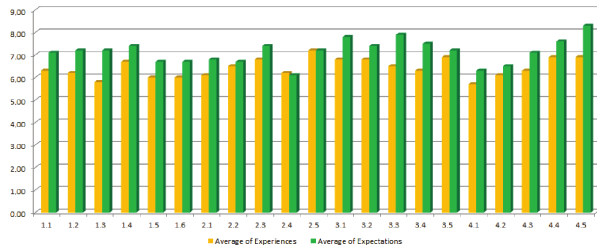


Fig. 1. Detection of the attributes for future competitiveness.

The average levels of expectations are higher than the actual level of experiences, which means that the stated targets were not fully achieved. The below listed graphic (Fig. 2) implies that among the attributes with the biggest gap only one is expected to get worse. This attribute is marked by red rectangle over the attribute.

BCFI (OP)

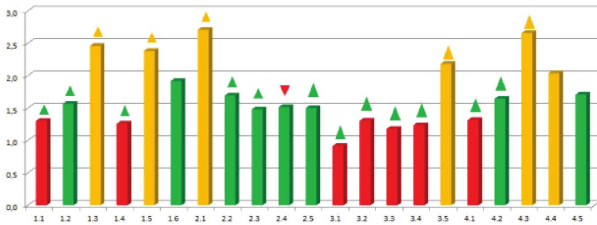


Fig. 2. Balanced Critical Factors (Operations Priorities).

The red marked attribute (2.4) is *Control and optimization of all types of inventories*. This implies well the assessment situation *after the crisis* – the consolidation of municipalities, which can be seen as the result of changed operation environment.

The implementation index (IMPL) was used for evaluating the usability of the results from the AHP assessments. The IMPL value is calculated by dividing the standard deviation of attribute assessment results by the value of the corresponding average value [31]. The Fig. 3 shows the level of deviation between the participants' responses. The lower the value of an attribute the more reliable the result is.

Technology IMPL

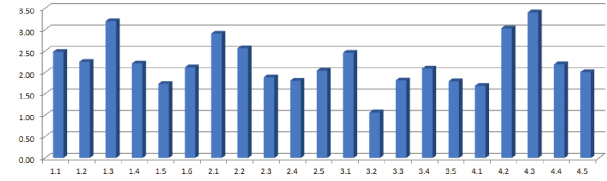


Fig. 3. Technology IMPL.

In the survey that has been done to supervisors, the most important factor that affects to operations is quality (61 %). Figure 4 shows there are strong needs for time to sustain quality. In daily jobs supervisors needs to cooperate with other Facility Management units and several customers. They have to guide employees and, of course, supervise operations in facilities services. In the survey that has been done to the workers the most important factor that affects operation is quality also (68 %). The more strongly affecting factor is time (27 %) (Fig. 5).

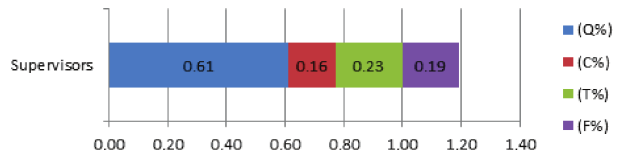


Fig. 4. Supervisors Operations Factors.

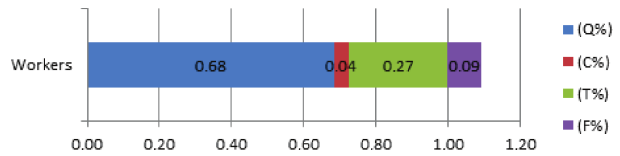


Fig. 5. Workers Operations Factors.

Maintenance manager did the same survey after the actual flood crisis. Figure 6 shows the most important factor that affects operation is quality (67%) in past and future (65%). Comparing to supervisors different factors are time and flexibility. Content of the tasks is showing in the results.

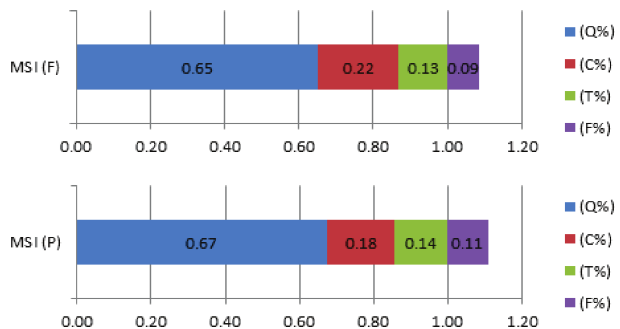


Fig. 6. Manager's Operations Factors (Past & Future).



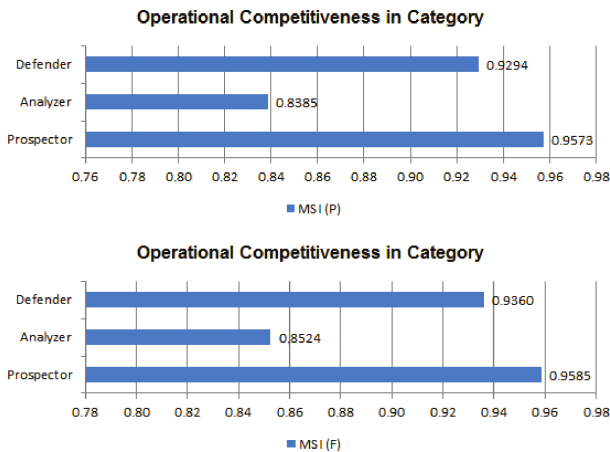


Fig. 7. Operational competitiveness in category PAD (Past & Future).

Manager & supervisors has responsibility to achieving key performance results. Therefore they have a financial moment in the weekly meetings. The important factor for both is the cost. The strongest affecting strategic type in the supervisor's level is prospector. It is same as in the manager and workers level has (Fig. 8). In the future strongest affecting strategic type in the manager level is prospector (Fig. 7). Maintenance manager has to make estimations and research to evaluate possibilities and risks. Need for managing finances rises because the demand for productivity rises in the public sector. The methodology to allocate preferable strategy type is liable.

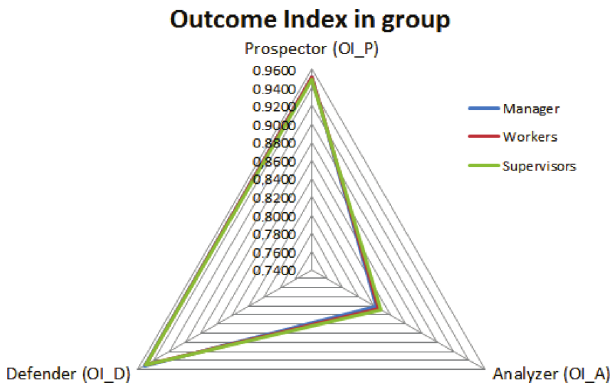


Fig. 8. Outcome indexes.

The leadership index (LI) is based on the weighting of factors, i.e. deep leadership (DL), passive leadership (PL), controlling leadership (CL) and individualized consideration (IC), inspirational motivation (IM), intellectual stimulation (IS), building trust and confidence (BT). Managers task, monitoring performance of the processes for every situation, shows in the Figs. 9 and 10. Controlling leadership index is higher than other levels. This is parallel to the unit's

strategic goal, to achieve change in operations culture from reactive maintenance to proactive maintenance, repairs and replacement.

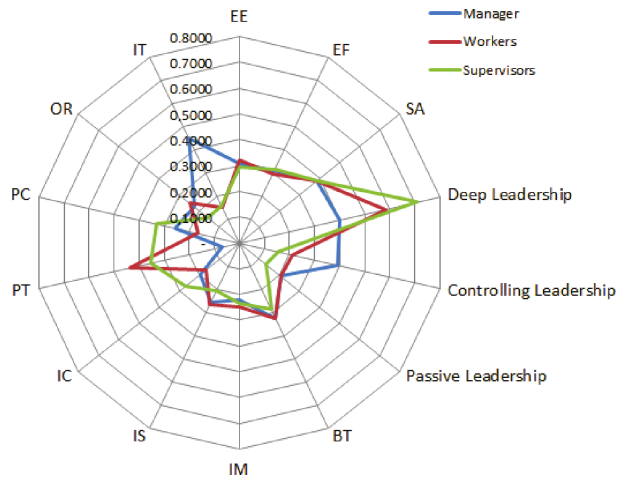


Fig. 9. Transformational leadership factors.

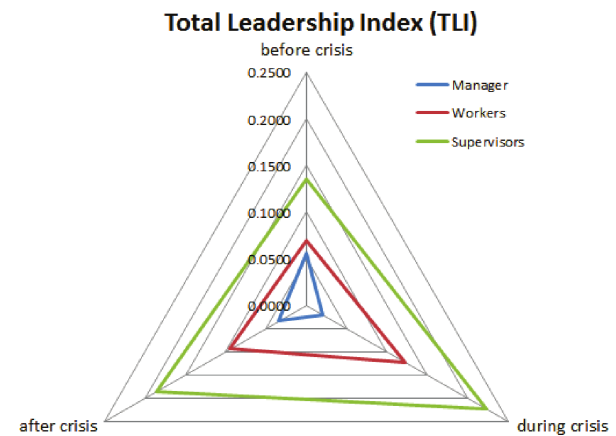


Fig. 10. Total Leadership Index (TLI).

A long-lasting co-working between workers and supervisors shows in the Figs. 11 and 12.

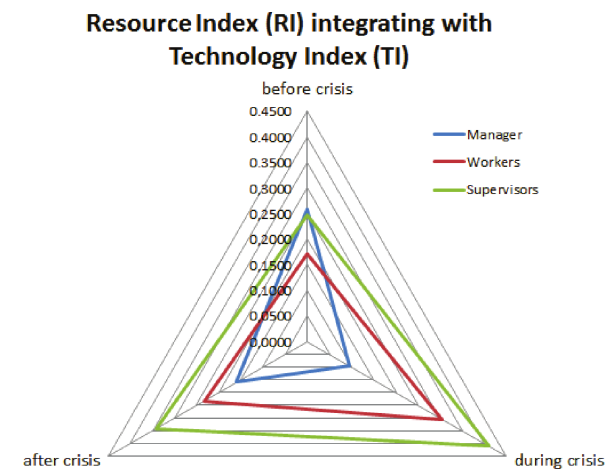


Fig. 11. RI integrating with TI.

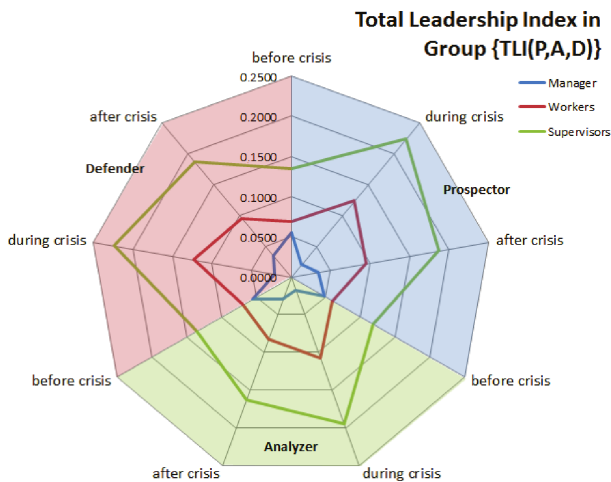


Fig. 12. Total Leadership Index in Group PAD.

Job satisfaction results has been higher than average in the Environment and Technical Infrastructure Service Center [32]. All informants gave same indication. The results indicate trustful relationship and good atmosphere in the unit. For successful operations affection of the supervisors are essential. They design, change and supervise daily working processes and create working time and project schedule for every year since 1980. Therefore supervisor's deep leadership index should be much higher than unit's manager. Maintenance manager other task, preparedness liaison officer, is showing at figure above too – be prepared, do future scenarios. The results indicate that workers and supervisors have experienced and they have critical knowledge about resources allocations. Weak real estate conditions foreseen unpredictable needs of repairs. Working at during incident has been occurred and will be in the future too. The City of Seinäjoki has 605 different building from few square meters hut to thousands square meters service buildings which include e.g. school, sport hall, daycare center, etc. The replacement value of the real estate property is approximately 456 Million Euros. The need for maintenance actions are over 8 Million Euros per year. The condition class index of the real estate property was approximately 75% (2010–2011), which means Good ( $\geq 75\%$ ). According to Trellum Consulting (2010) this index is based on the estimation and evaluation on the sites. Assessments underline the fact of risk possibilities in several buildings. Heavy rains or other nature hazards, construction defects, wrong use, etc. may cause need of unforeseen repairs on the buildings. A critical factor for indoor climate conditions and thereby building users too, is the water damage. The challenge is in relation to where and when the damage is detected. Humidity exposure may pre-

vent use of the premises for the time of drying and repairs.

Oulasvirta writes interest of her study was to determine how the upper level of the organization to provide a service is justified to assess. The conclusion of her dissertation underlines the lower level of the organizational point of view, is not sufficient to evaluate the upper e.g. quality award criteria. What is essential is whether the upper successful in their own part of the work to support services end users [5].

## Discussion

The workers and supervisors have been working together 20–30 years. Maintenance manager has been working four years at the target organization. The results bring out the affection of the crisis basically in the management level. As Oulasvirta describes an opinion of the other levels should be taken into account of. There have to be more respondents from different levels, although the results in different level form “right”. Commonly the most important criterion “quality” could be seen in knowledge, material choices, in know-how and identification of malfunction mechanism in the building. Result is also parallel with the expected value of the stakeholders. The quality of construction, building or maintenance affects the value of the real estate property.

The worker's level results validity and reliability are intelligible. Taking care of the occupational safety, the carefulness and the exactness of the craftsmanship are the factors of the quality in the working level. The quality work shall need time in the right place. The quality has been defined at several department meetings for the workers since last three years: much more important is considered euro per lifespan like an unconsidered euro per hour. In regard to the resources the most critical factors are the preconditions made possible by information and the technology, the quality management of the products and functions and processes, clear task divisions and responsibility divisions at separate stages of the process, utilizing of different organizing methods. For the general operations, in regard to the resources some of the critical factors are the developing, information technology, cooperation of processes and customers. These factors shows right direction in the customer orientated actions. The unit carried out customer satisfaction inquiry [33] to whole organization of the City of Seinäjoki in the summer and autumn of 2011. The responding rate was over 16% ( $n = 509$ ). Maintenance manager produced the Quality Guidance Handbook [34] to the unit conducting

to the results. Implementation started in the beginning of 2012.

### Conclusions

The study of implementing sustainable competitive advantage to the public sector’s management system is essential – it uses the Sensing and Responding methodology to finding critical factors in experiences and expectations between different organizational levels. It checks do the all aspects efforts or not. The study presents methodology which ensures that the various levels of the organization are operating in accordance with common strategy. The target organization is one of the many units of the public sector in Finland. All those units and their strategic private partners form a chain for the goals of the Society Security Strategy [35]. The value of the methodology is in its ability to make the structure of the organizations and strategies transparent for developing actions. General finding of the development work is an importance of information technology for the target organization and transformational leadership for proactive preparedness [36] (Fig. 13).

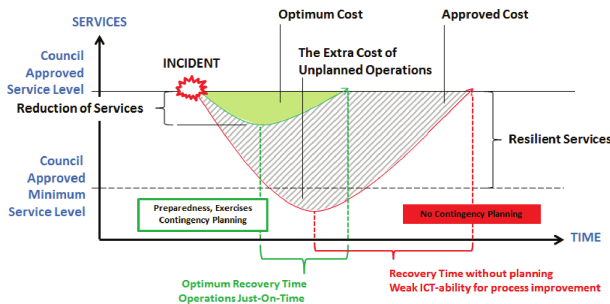


Fig. 13. General findings for process improvement in the target organization.

Preparedness as an operational action has a strategic goal: ensures minimum disruption to the management of the tasks in all situations [37]. Still, this public sector’s continuity planning is quite often imagined to be a mechanical work of writing or just updating names in the documents. However, society’s preparedness for the last few years has shifted in exceptional circumstances to usual fault and special situations [28]. In those cases the key challenge is catch up the gap between imagination and reality before the worst case scenario is realized [38–40]. Accomplish sustainability to the operations need for preventing on design [41]. Designing work is identifying, assessing and analyzing the organization or environment what are the threats or operations vulnerabilities in there. To succeeded service producer have to know customers core operations to steers support-

ing services. Participation to the quality work is essential [42–43].

On the other hand preparedness and comprehensive security are a part of municipality’s security policy and citizen’s comprehensive well-being [44]. According to rescue director the preparedness plan should approve by the City Council as other policies [45]. According to audit manager of the City of Seinäjoki monitoring and evaluation of the objectives of preparedness plan should be carried out annually. Therefore the steering of the prevention actions should be link to annual budget and financial plan. Figure 14 shows the proposition for steering of proactive preparedness to achieve sustainable competitive advantage.

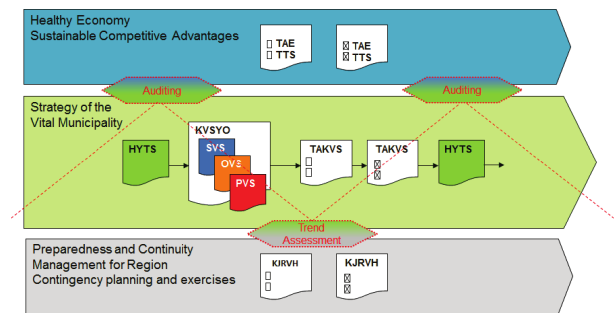


Fig. 14. Steering processes for SCA.

Table 1  
Abbreviations of the steering process (Fig. 14).

HYTS	Well-being and comprehensive security plan (Approved by City Council)
KVSYS	Preparedness plan (Common part, “threats in general, nationally”, Approved by City Board)
SVS	Preparedness plan (Strategic part, “for whom, where and why we are doing”)
OVS	Preparedness plan (Operational part, “how we do it”)
PVS	Preparedness plan (State of emergency situations, “war clouds, nuclear fallout, pandemic”)
TAKVS	Preparedness plan (Service Center’s design for preventions, annual actions)
KJRVH	City’s practicing (by an order of Mayor)
TAE TTS	Annual budget and financial plan

### Research highlights

The research design key was the question how to ensure that the various levels of the organization are operating in accordance with a common strategy. The practical result of the SCA methodology utilizing includes an important aspect of the multi-level



organization's service production: an access to information. During the process of sense and respond, operational strategy adjustment systems were developed by utilizing critical factor evaluation. System development led to the practical win-win-win solution in collaboration with the unit's business partners after the research ended (Fig. 15).

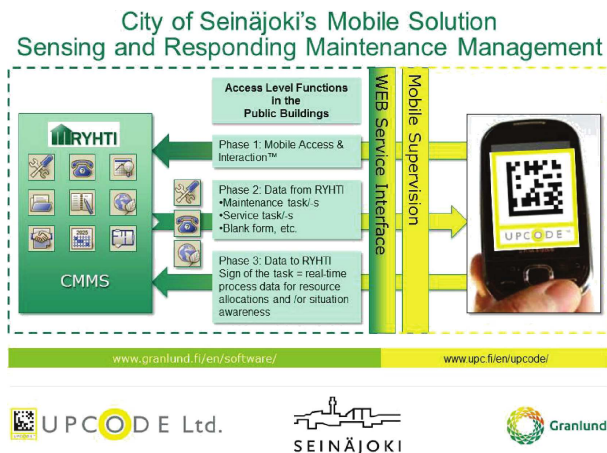


Fig. 15. The practical result of the SCA implementation 2012–2013.

The obvious benefit of the SCA methodology utilizing from practice point of view is in its ability to make the structure of the organizations and strategies transparent for developing actions. On the other hand, the weak side methodology is its high requirement of knowledge. It is a consulting tool that needs adjusting and calibration of the successful use. So that they are pointing in the “right” direction, the SCA methodology user has to be experienced from many tasks.

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