

## METRICS IN THE PREPAREDNESS PROCESS

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**Abstract:** The phenomenon under study relates to the preparedness process. We need metrics to achieve multi-strategic goals. Situational factors and the direction of development of operational priorities are measurable factors. Public officers need measure these, that political decision-makers leads in the right direction. The research problem of a new servant in office is how to interpret the measured results to make a decision proposal. The research method was an action research. The problem solving follows the logical steps of the Deming Cycle: Plan the exercise, Do the notes, Study the content, Act customer-oriented. Multi-method approach promotes value-generating processes in the region's hybrid organization. The evaluation of results is based on stakeholder feedback, a participate-decision by the City of Kotka's Urban Board and a decision on funding by the Kymenlaakso Regional Council. In practice, content analysis of situational factors creates certainty of interpretation about the direction of development of operational priorities. This is important for BCFI analysis especially in turbulent situations. Implemented in the context of the readiness exercise, this was found to be exceptionally meritorious.

### 1 Introduction

The City of Kotka is a key player in a Kotka-Hamina region as the largest residential centre and the 19th largest city in Finland [1]. The city is home to 61 % of the population in the region. Of the 21 major Finnish cities, Kotka has the fifth largest number of immigrants, 9.6 % of the population [2]. The Kotka-Hamina area, formed by two cities, is located on the southeast coast of Finland [3]. From the supply point of view, the region is nationally

significant. Port of HaminaKotka Ltd is Finland's largest port, with regular connections to all major ports in the world. Port of HaminaKotka Ltd is a joint-stock company owned by local authorities, the City of Kotka (60 %) and the City of Hamina (40 %) [4]. The joint-stock company is one of many in Kotka Group businesses [5]. Thus, the public shareholders play an important role in corporate governance to deliver value to society.

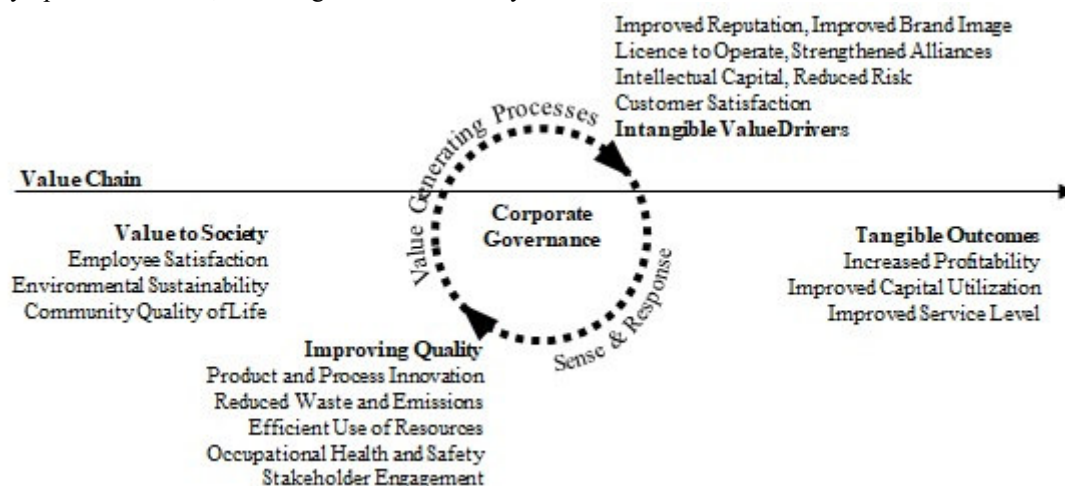


Figure 1 Linking value generating preparedness process to sustainable development by value chain securing

The Finnish concept for comprehensive security means that the vital functions of society are ensured through the co-operation of authorities, citizens, companies and the third sector. The way that works based on the crisis management model in which competent authority supported by all relevant security actors [6]. The key idea

of the society's security strategy is that we are all security actors. The role of local government is crucial as the decision-making system directly influences the foundation of the crisis management model, in other words, the above-mentioned stakeholders. Based on the author's years of experience in the research field, a strategy that reinforces a

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community-wide operations, enhance resource-based view [7] and strengthen mutual trust [8], thus, promote a joint performance [9]. Figure 1 illustrates stakeholder value generating processes in value chain securing, owner collaboration, and value-generating factors [10,11].

**1.1 The need for an action research**

Working in the City of Kotka with the Kotka Group has taken a year. The scope of the study 2019-2020 covers a larger entity than in the previous target organization 2009-2018. From a national perspective, and referring to the Kotka Group assets, the logistical importance of the current action research is far more critical. In both cases, the assisting target organization has been, and is, facing change. In responding change, actions have to be a part of continuity management to influence the competitiveness of the city properly.

The need for action research based on a situation: in which the organization performance and operational impact of an organization examined with making the necessary changes. This article addresses the statutory obligation of a public organization to act in all situations. It is challenging to meet all the obligations if there is a structural change in the organization and no common approach has not yet established. Background of the target organization in the City of Kotka is in two separate technical organizations: Facility Management and Municipal Engineering. The integration at 2019 brought together nine independent service units, without the common purpose, why the 400 employee's division exists. Identifying critical operational priorities can be challenging in such a situation, as the interpretation of criticality relative to the goal cannot made. However, the preparedness process includes trainings, in which provides useful insights into the expectations of the larger hybrid organization and people there. By developing dynamic capabilities, a public service organization has purpose; it shares a common identity, and gets enhanced opportunities to achieve joint performance [12].

The second reason for action research is a wicked problem. The preparedness process is continuous, works

year after year, and intended to work in all circumstances. A competent authority should be able to react as the situation changes in a turbulent environment. In order to be able to manage processes, it should be possible to measure demand for commodities, expectations for the management and service production system. On the other hand, disaster and emergency preparedness plans are not legally public, but all stakeholders must work together to make the processes work effectively to deliver a sustainable competitive advantage to the community [13].

Finally, the most important reason for action research is the personal interest as a researcher and as a director of technical services. To live up to expectations, management must be effective and results must support the sustainability goals of the city. To achieve above-mentioned goals, it is necessary to measure the direction of development of priorities and to be able to evaluate the results obtained. The need for methodological support in management is particularly evident in a disruption when the manager has begun in a new, security-critical organization, in a new area. Situational factors must identified in order to target decision-making properly – how else a new manager interprets what the measurement result looks like. In such situation, there is a need for a management takeover procedure related to forming situational awareness, to be relevant security actor, and on the other hand, to successfully deal with corporate governance to support region value generating processes.

**2 Methodology**

The theoretical framework of the study is based integration of two viewpoints of separate dissertations. Tuomi (2012) point out the quality management in public sector [14]. The situation factors need to know to achieve performance. Corresponding author introduced an innovative preparedness process to achieve joint performance - to conduct the Security Strategy of Society and the City Strategy to the critical public service unit's Operations Strategy [7]. Figure 2 illustrates a theoretical framework of this action research.

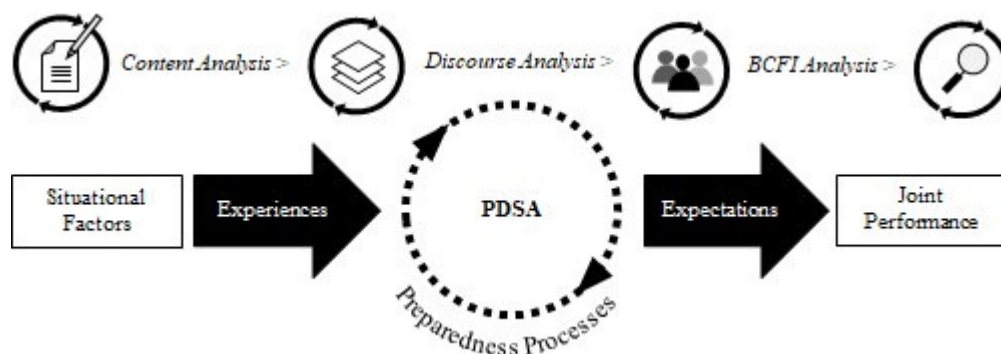


Figure 2 a theoretical framework of the study

The multi-methodology based action research was carried out in the previous organization of the researcher.

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The study has published in international peer-reviewed publications. In this publication, objectivity achieved through the same manner. There are two levels at the public sector, an administrative level and an operational level. The feedback of decision-makers tells whether the results and the development measures are successful as intended. The

structure of the theoretical framework reflects the narrowing gap between expectations and experiences.

The decision-making and implementation system is shown in figure 3. One-year timeline includes several board's meetings, and different exercises. Because the timeline is a continuum, the graph represents the process metrics.

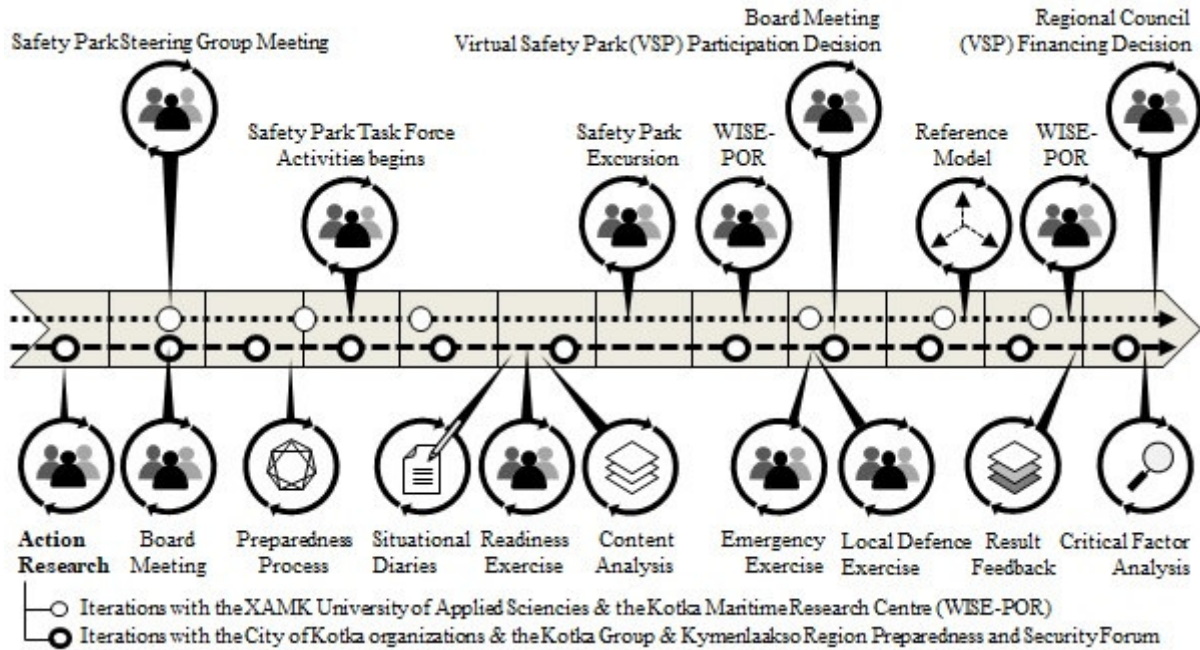


Figure 3 dashboard of iterations in the study's timeline

Knowledge of the procedure above is useful, without compromising the security of classified information. Thus, the study conducted in a manner that does not open the detailed content of the diaries or exercises. The decision limits a bit the degree of freedom of the study. For example, the mutual evaluation of daily logs content with operational priorities in the Analytical Hierarchy Process [15] present in figure 4 left out. The paper describes developed procedure and feedback from decision-makers indicates the qualitative correctness of the choices made.

The readiness exercise lasted two days at June of 2019 and produced two situation diaries. The diaries maintained by the two of divisions' employees who had good

knowledge of their field of expertise. Situational factors are issues, which representatives of all divisions in the city, the city group and authorities discuss and make decisions.

The purpose of producing diaries was to effectively contextualize the situation, evaluate the significance of data obtained, and successfully manage the division. At this stage, it is important to note the role of assistant personnel. There is a risk associated to the frequency of debriefing exercises. Many valuable findings can forget unless topics addressed as part of value generating process to the shareholders and stakeholders. Communication is a part of the management of public trust, as Port of HaminaKotka Ltd did [16].

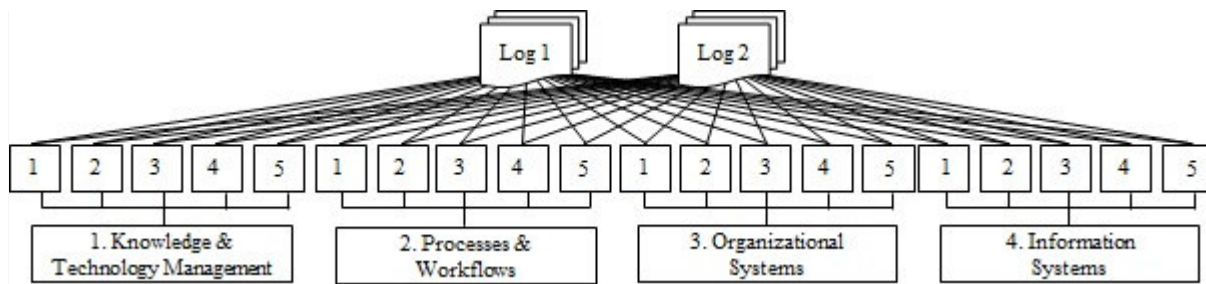


Figure 4 link between operational priorities and content of daily logs

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Table 1 presents the attributes of operations priorities for the management of technical services' division. In the action research, content analysis tells you what the text of the situation diaries are. The method is part of qualitative

research [17]. The procedure proceeds in such a way that the text is partitioned, processed and finally organized into a new whole.

Table 1 key management areas 1-4 and attributes 1.1 – 4.5

1	Knowledge & Technology Management	1.1	Training the staff of our organization
		1.2	Innovative research and development
		1.3	Communication from unit to unit and level to level in hierarchy
		1.4	Adaptation to changes in knowledge and technology
		1.5	Dissemination of knowledge and technology within the organization
2	Processes & Work Flows	2.1	Short and fast delivery times for order fulfillment
		2.2	Reducing unprofitable time
		2.3	Timely delivery to stakeholders (customers)
		2.4	Inventory optimization
		2.5	Customizing changes to requirements and orders
3	Organizational Systems	3.1	Organizational leadership and management systems
		3.2	Quality control of service processes and operations
		3.3	Well defined tasks and responsibilities in the operations
		3.4	Utilizing teams and other ways of organizing
		3.5	Code of conduct on information security
4	Information Systems	4.1	Information systems support processes
		4.2	Visibility in information systems
		4.3	Availability in information systems
		4.4	Reliability and quality in information systems
		4.5	Functionality and usability in information systems

Content analysis is an efficient alternative for tracking public opinions, the direction of demand fluctuations over a given period of time, political tendencies, or mapping emerging ideas in the aforementioned iteration rounds.

Microsoft Excel spreadsheet software used to classify the content analysis issues. The data categorized in relation to the four key management areas. Table 2 shows the principle of contents of daily logs integration with technical services management.

Table 2 connection chart of content analysis and operation priorities

Content of the Daily Logs	Content Applies to Knowledge & Technology Management					Content Applies to Processes & Work Flows					Content Applies to Organizational Systems					Content Applies to Information Systems				
	1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	2.5	3.1	3.2	3.3	3.4	3.5	4.1	4.2	4.3	4.4	4.5
Day 1, # 1																				
...																				
Day 2, # n																				
Day 1 $\sum n/N$ :																				
Day 2 $\sum n/N$ :																				

The methodology section of the study works as a discourse analysis of the mechanism how the text and results obtained [18]. Iteration runs with stakeholders', and works as a continuous quality improvement model, consisting of a logical series of four key phases: Plan, Do,

Study, Act. Implementing multi-strategies requires strategic choices, collaboration and interoperability from the supplier of critical public services to secure value chains. Figure 5 illustrates the discourse analysis utilized with the SIPOC strategy map [19].

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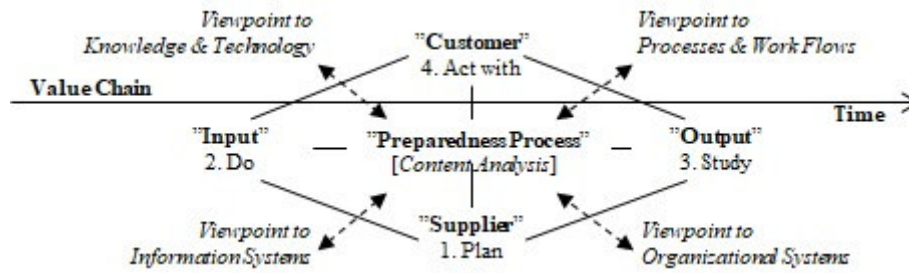


Figure 5 SIPOC strategy map for discourse analysis (Adapt Kaplan & Norton 2004, Vornanen 2017)

The diagram tells how the critical public services supplier plans to utilize resources, in other words, the inputs. The information systems needs to produce situational awareness of these. The order-fulfilment progress, when the process works by studying outputs and acting with stakeholders. Common awareness increases reliability and mutual trust, and thus joint performance: as a result the value chain being secured by preparedness process.

The Balanced Critical Factor Index (BCFI) analysis is a strategic decision support tool [20], which is based into Sense & Respond method [21]. The tool shows, which feature is critical and which is not. In this case, the criticality of the difference between expectation and experience arises from the gap between these two factors: is the direction of development worse or better. The calculations are sensitive to the behaviour of statistical data. Table 3 presents the questionnaire sample. [22]

Table 3 questionnaire sample of the BCFI –analysis

			Expectations 1-3 year	Experiences 1-3 year	Direction of Development												
					Evaluate the future (Tick the box)			Evaluate the past (Tick the box)			Compare to competitors (Tick the box)						
					Rate 1...10	Rate 1...10	Worse (W)	Same (S)	Better (B)	Worse (W)	Same (S)	Better (B)	Worse (W)	Same (S)	Better (B)		
1	Knowledge & Technology Management	1.1															
		...															
		1.5															

The calculations are based formulas (1), (2), (3) and (4), as shown below.

$$I_{Imp} = \bar{x}_{Ep}/10 \tag{1}$$

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

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

$$I_{CF} = \frac{s_{Ep} \times s_{Er}}{I_{Imp} \times I_{Gap} \times I_{DoD}} \tag{4}$$

*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

The author expected to receive at least three responses from both of the key service processes. In December 2019, a questionnaire distributed to all participants at the division’s management briefing. The

response time was two weeks and everyone allowed responding anonymously.

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**3 Result and discussion**

**3.1 Creating situational awareness by content analysis and discourse analysis**

The results of the content analysis shown in the following two figures. Figure 6 illustrates clustered keyword entities showing trends in demand. On the second

day of the readiness exercise, the Executive Team's Summary Surveys increased. This is a reason why the sum of the percentages for the second game day is greater than 100%. Figure 7 shows the distribution of the completely analysed material in relation to the division's operational priorities.

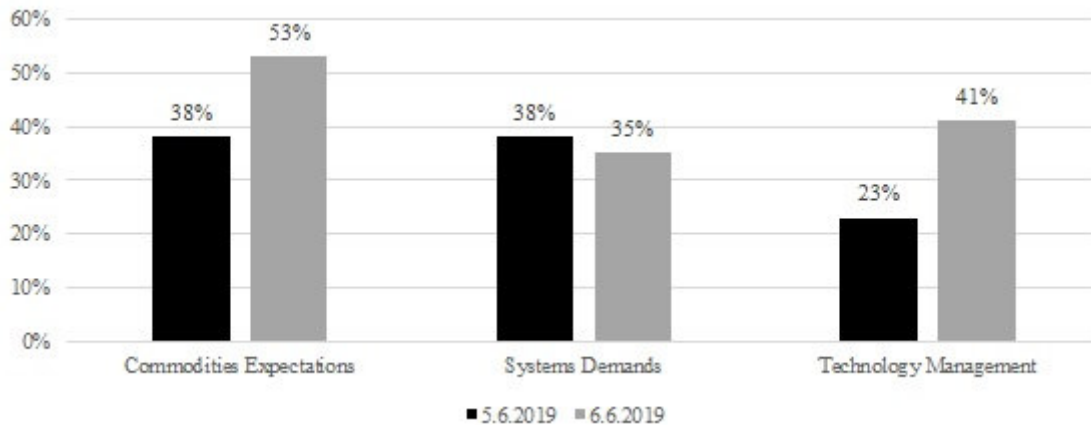


Figure 6 grouping game feeds based on content analysis

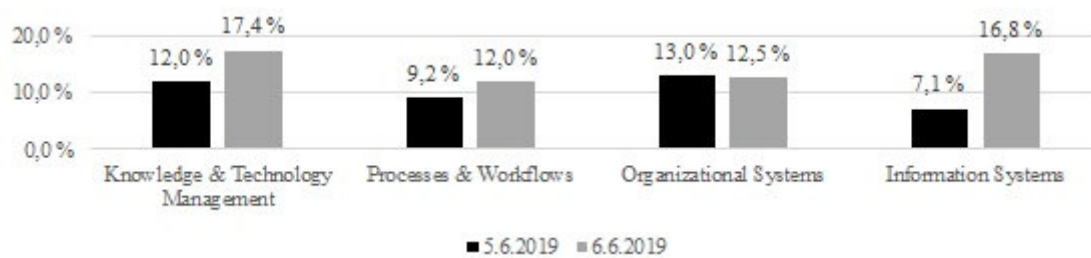


Figure 7 grouping game feeds to operations priorities based on content analysis

**3.2 Evaluation of BCFI analysis responses**

Total number of respondents was 14 of 65. Six replies received from different municipal engineering units and eight from different construction units. Not a single answer came from the division's administration. The respondents

represent managers, experts and supervisors. The amounts are sufficient to describe the method. Reliability and validity of this study assessed by public feedback from stakeholders. Figure 8 shows the answers of all respondents.

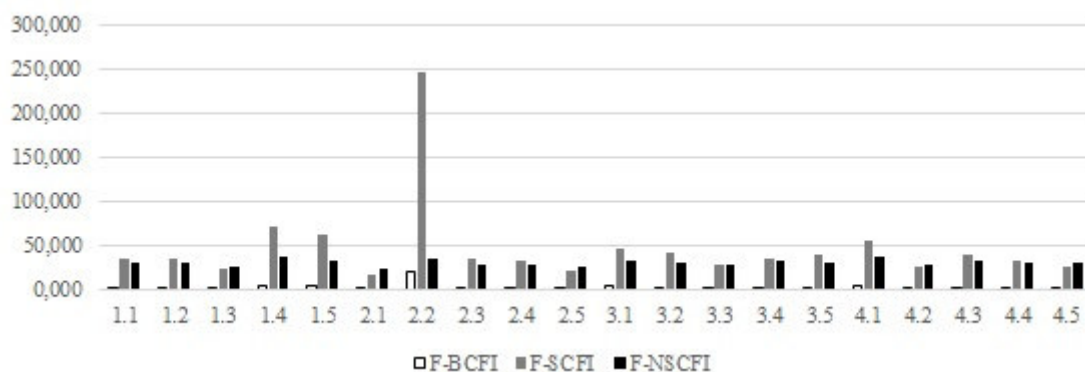


Figure 8 operations priorities for the division's management process

The figure compares a balanced CFI-analysis, a scaled CFI-analysis, and a normalized scale CFI-analysis. The

difference between analyzes is in their sensitivity to statistics. The purpose of using three CFI analyses is more

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easily to identify so-called weak signals among the indicators. The highest peak among the attributes of Processes & Workflows is number 2.2 *reducing unprofitable time* in subprocesses, In Knowledge & Technology Management the strongest feature is *adaptation* (1.4). In Organizational Systems, the strongest feature is *leadership* (3.1), and in Information Systems, *processes support* (4.1). The four factors point to the root cause.

On the other hand, these refer also to the need for change management and research on manufacturing strategy (Quality, Cost, Time, and Flexibility). Facility Management and Municipal Engineering organizations has been scattered across buildings in the city for more than a decade. A common identity could hardly form. There is a need for a division headquarters. To clarify the

organizational structure, the director assembled nine units into a management process and two core service processes. The operating units in the processes are the Common services unit, the Infrastructure unit, and the Buildings unit.

Figures 9 and 10 demonstrate the respondents' view. The attributes with the biggest gap between past and future are the strongest ones. In fact, due to amount of basic and core technology in the units, some priorities that stands out. The Infrastructure unit, as known as the first core process emphasized adaptation to knowledge and technology (1.4), and reducing unprofitable time (2.2). The Buildings core process emphasized innovativeness and performance of research and development (1.2), timely delivery to stakeholders and customers (2.3), and reducing unprofitable time (2.2).

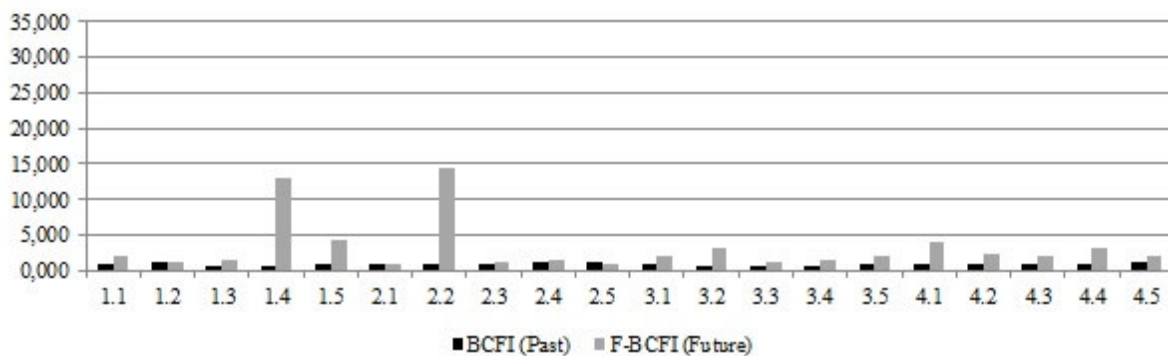


Figure 9 direction of development by experiences and expectations in the Infrastructure unit

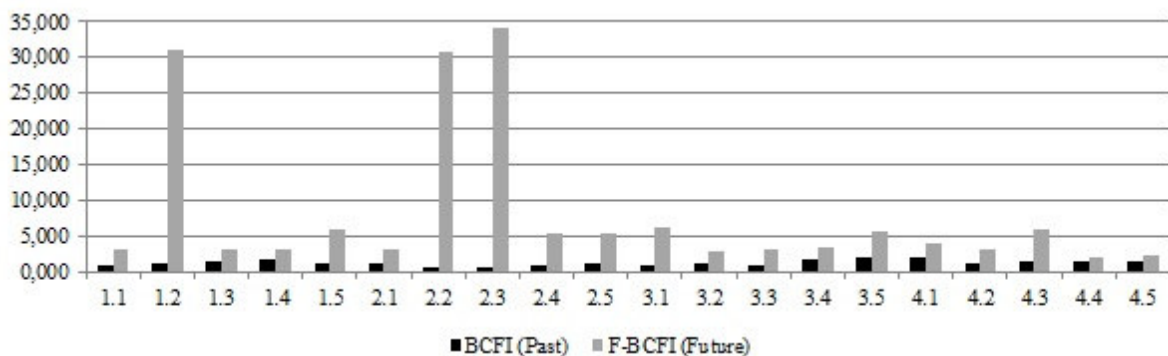


Figure 10 direction of development by experiences and expectations in the Buildings unit

The answers given by the division's staff suggest that the customer expectations and experiences in the service taken into account. The critical factors point to the aspects of the knowledge and technology management as well as the process and workflows. There are aligning with the findings from the city's command centre. Content analysis linked expectations and demand fluctuations to these. Improvement requires, for example the use of information technology, and usability of common systems.

On the other hand, looking at the holistic picture at the timeline, there are broader expectations to the information

systems than those in the division's core processes not identified as critical. The exercises in the preparedness process generated and deepened a stakeholder-based view of expectations. Responding to these requires updating the Code of conduct.

**3.3 Continuity management overview**

The "paper & pen" content production method is reliable, deployment is fast, and it works in all circumstances. However, very exceptional circumstances are rare although possible. On the other hand, a diary is not

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dynamic, and basic office application skills do not provide a competitive edge. Advanced Excel use is desirable because the program is widely used. Data exported to Excel can generate Gantt allocations, dynamic maps, and an interactive dashboard for the management team in the city’s command centre.

Since it is not possible to do everything at once, choices have to make. There were not many critical factors in this study. If there were many, it would have been necessary to analyse mutual criticality in order of implementation. Then the AHP method needed. Competitive review is important. The corresponding author and the safety park task force made an excursion to Finland’s oldest safety park. The joint-development project got so-called “meat around the

bones” during the iteration rounds. Discussions and visits provided insight into what security-related activities could be, what should avoided, and how the actions selected would improve the observations made during the readiness exercise. As the preparedness process progressed, the findings taken into account in the emergency and local defence-training plan, and tested in the exercises.

The implementation of Security Strategy for Society and its concept for comprehensive security formed a common direction for technical services’ development. Figure 11 gathers integration themes and viewpoints from iterations rounds into an EFQM-based [23] and evolving quality development model.

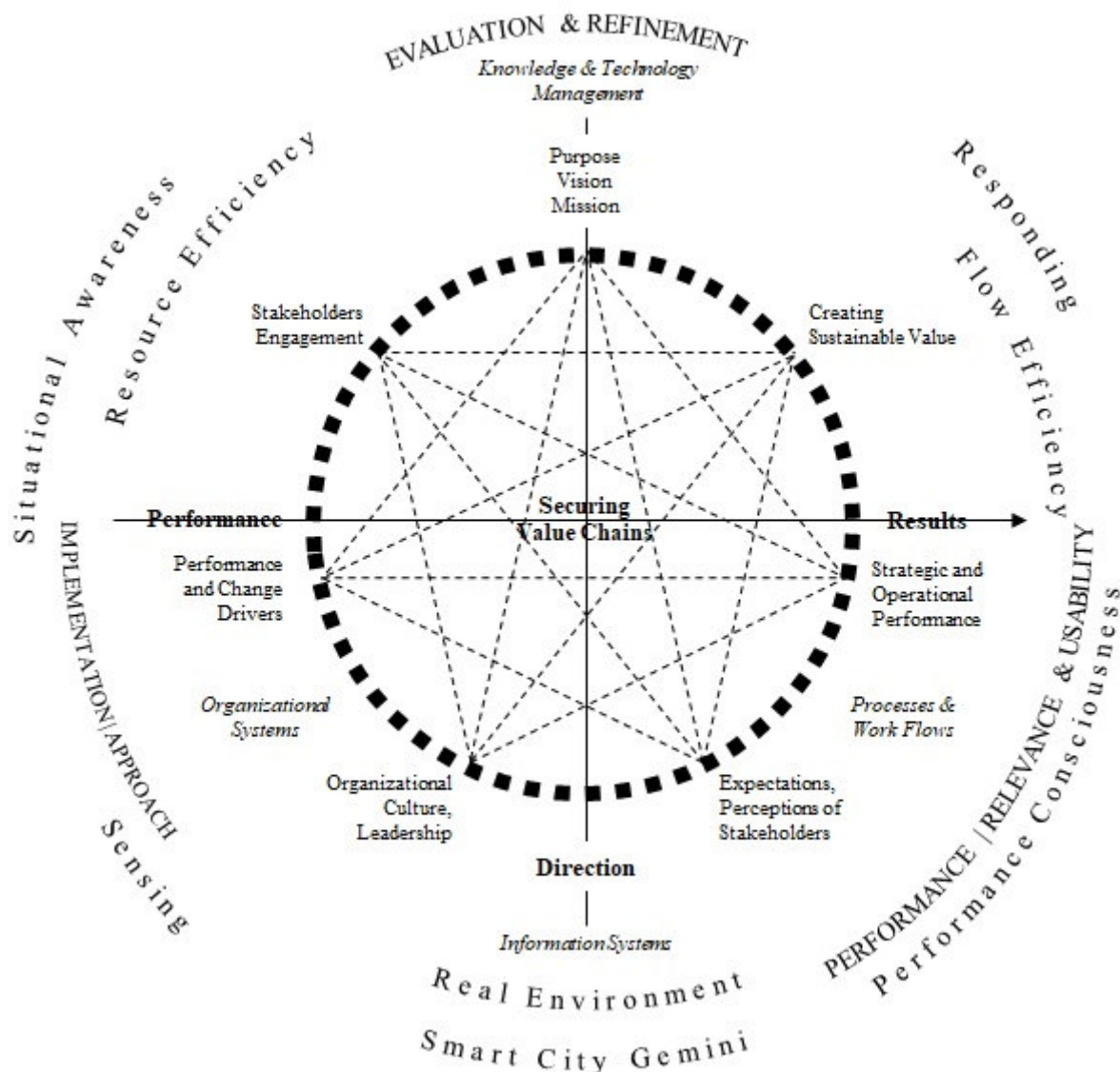


Figure 11 viewpoint integrator for the technical services division operating in the city by the sea

**3.4 Public feedback and recognitions from stakeholders**

According to risk management manager Kiiski the City of Kotka received a lot of positive feedback from the KYMI19 readiness exercise. Director general of Regional



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state administrative agency of Southern Finland and actors from the Helsinki-Uusimaa Region, its 26 municipalities and a wide network of stakeholders, including YLE News, and HUS Helsinki University Hospital reported that the measurement (in the preparedness process) considered an extraordinary merit in practice [24].

The city of Kotka decides to participate in the Virtual Port Logistics Safety Park joint-development project with the Southeast Finland University of Applied Sciences. The aim of the project is to provide occupational health and safety education for port and industrial logistics companies, to create lasting conditions for a virtual development environment, and to find a financial solution to manage the safety park [25].

Referring to the three-year funding for the Virtual Port Logistic Safety Park joint-development project decision, the reasons for the decision are as follows. The applicant and the content of the project meet the specific objectives. The project supports the Kymenlaakso Smart Specialization Strategy by making a significant contribution to the development of industries important to the region (Logistics and Digitalization). There is a clear continuity in the exploitation of the project results. The project activities will launch and lay the foundations for the operation and further development of a physical safety park of port logistics.

Particular interest is the utilization of the virtual reality environment to manage the risks of a physical safety park and to develop new features or processes. The project received a score of 43/60 in the evaluation [26].

#### 4 Conclusions

Approaching to management and implementing the city strategy of a 400-person organization involves identifying, evaluating, and in some cases redefining actions. In redefining, content analysis is important. In a year, the division found a purpose, direction and vision which are in line with the ones of the city. At the end of 2019, the technical services division launched co-operation negotiations to update the Code of conducts and restructure. Nine units will merge to three, and organizational levels will lower five to three closer to the customer interface.

The conclusion of action research is, a content analysis of situational factors creates certainty of interpretation about the direction of development of operational priorities. The phase plays a key role in the preparedness process like the PDSA cycle from content analysis (Planning phase) to discourse analysis (Doing phase), and to BCFI analysis (Studying phase) to strategic decision-making (Action phase). The value chain becomes secured in the process in a measurable and sustainable way, transforming intangibles assets into tangible assets.

The study identified the need for deeper research. Analysing the manufacturing strategy would give the city an insight into other organizations studied in different countries around the world. In order to realize the city's

vision of being the gateway to new opportunities, carry out further research is well founded.

#### Acknowledge

The city of Kotka has an example of turning intangibles into tangible benefits: visionary park architecture that utilizes its maritime war history. It is interesting how marine environment and especially many praised parks, contributes to the identity of the transforming hybrid organization. The whole region benefits from the values of sustainable development. The work on the parks has been going on for decades, and the culmination of the work can see as having received three simultaneous Green Flag Awards at 2019 [26]. These three city parks represent 60 % of all five awarded parks in Finland. It can say that the city by the sea is a real capital of parks in Finland. A significant environmental activity that has influenced the quality of life the residents is the Catharine Sea Park. The former oil industry area of the Port of HaminaKotka Ltd has transformed into a seaside park. The park attracts 250,000 visitors every year. In this context, it is good to acknowledge Mr. Heikki Laaksonen, the City Gardener of Kotka, whose work for the city and society been recognized with the Finnish honorary title of *puutarhaneuvos* [27]. Successful examples of sustainable development invite others, like Google Ltd, to establish themselves to the very good marketplace [28].

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**Review process**

Single-blind peer review process.