

# How to Create a Safe School Environment that Provides a Platform for Excellent School Results and International Business Opportunities?

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*Abstract:* - The aim of this study is to provide an improved understanding of the structural characteristics and the dynamic evolution of a safe school environment that provides a platform for excellent school results and international business opportunities. The study is based on the results and lessons learned from the 'Security and Safety in Universities' project executed 2009-2010, special attention taken how to utilize that knowledge within a new construction production. The evidences of this qualitative case study consist of participatory observation, in-depth interviews with different stakeholders and multitude documents. The study shows that a safe school environment concept could be seen as a new service innovation with a huge new global business potential. The results of the study suggest a four years research road map that trails the path of service innovation development supported by new technology solutions.

*Key-Words:* - Prevention of severe targeted violence, Public safety, Resilience of built infrastructure, Safety and security, School security, School shooting

## 1 Introduction

RYM Ltd, founded in 2009, is the strategic centre for science, technology and innovation of the built environment in Finland. It is a venture for intellectual capital operating in the real estate and construction sector that invests the funds and know-how of companies and public financiers of innovation in research areas most important for international competitiveness. [1]

### 1.1 Energizing Society Program

The core of RYM Ltd's activities consists of research programs based on research strategy decided by the shareholders which the companies implement together over a 3-6 year period. The tentative vision of the Energizing Society Program is that urban planning and construction are a recognized cutting-edge expertise area of the Finnish real estate and construction sector. Ecologically sustainable community concepts based on utilization of digital technology have become a growing and profitable business both in the markets of developing countries and domestically. [1]

City of Espoo represents a dynamic intersection between science, business and art. The formation of Aalto University also combined the same three disciplines: science, business and art (In Finnish:

Tiede, Talous, Taide = T3). Consequently both Aalto and the City of Espoo have used the notion of three Ts as a way to illustrate this basis for cross disciplinary innovation. Within Espoo this has been branded so that the south-east area of the city is called the T3-area. [2]

Espoo has identified three pillars for its own strategy: being a caring city, actively promoting environmentally friendly solutions and positioning itself globally as a leading city for innovation. In line with its strategy and vision Espoo has been actively networking with key stakeholders in the city to establish new initiatives that will support the objectives that are stated in the 2020 vision. One of these activities has been relating to the development of the T3-area as an area that will integrate science, culture and business to provide an attractive innovation environment for creative individuals and leading companies. The area will see a high degree of construction activities over the next ten years, approximately 4-5 billion €. This also supports the idea to take the opportunity to transform the T3-area into a world leading innovation ecosystem. [2]

Espoo, as the anchor organization of the Regional Innovation Ecosystems work package within the Energizing Society program, wants to develop new concepts for innovative collaboration

between companies, universities and research institutes, as well as the public sector, most notably the city organization. This will be done in the form of action research. Espoo and its partners will initialize and nurture a number of separate demonstration projects. These projects will be rigorously observed and influenced by different research teams that will combine their own research findings with the practical experiences of the people working in the demonstration projects.

Subsequently the Regional Innovation Ecosystems work package will test and institutionalize new practices for the implementation of sustainability demonstration projects using construction activities in the City of Espoo as the platform.

The results of this work package will have an impact on the global innovation research agenda and the participating companies. In addition it will result in a vibrant Living Lab environment, demonstrating what can be done by a city, and subsequently attracting new entrants to enter the Finnish metropolitan region.

The formation of the research consortium has taken place by an in-depth evaluation of what particular activities different companies could consider to initiate to support the objectives of the Regional Innovation Ecosystems undertaking. Representatives from more than 20 companies were interviewed, and ideas generated through these interviews were subsequently gradually refined into concrete project plans, with one particular organization responsible for each demonstration project. As a result 8 different demonstration projects have been identified; Safe School Environment being one of them.

## 1.2 Structure of the rest of the Paper

Chapter 2 of this paper discusses the theoretical background of this study consisting of three different viewpoints: how to create an innovation; how to make large-scale urban built infrastructures more resilient against attacks and disruptions of different kinds; and why severe violence in schools and other educational institutions has become a rising concern in many developed countries in recent years. Chapter 3 presents the research targets and methods applied in this study as well as how the research process has proceeded. Chapter 4 covers the descriptive data about the case being studied; Opinmäki (Learning Hill) 1<sup>st</sup> phase. In Chapter 5, the research findings are presented and evaluated against the theories presented in Chapter 2. Chapter 6 sets out the conclusions of the study and answers to the research questions. The last chapter also

includes an assessment of the study and suggestions for further research.

## 2 Theoretical framework

### 2.1 Innovation Creating

There are multiple paths how innovations are created and commercialized. One model that gives a practical and structured framework for innovation work is the NABC approach created by Stanford Research Institute (SRI). NABC highlights market Needs, solution Approach, solution Benefits and Competition of any solution being created. Within the NABC framework, the following questions should be answered:

What are client's needs? A need should relate to an important and specific user-client segment or a well identified market opportunity, with the market size and end customers clearly stated. [3]

What is our compelling solution to the specific client need? Draw it, simulate it or make a mock-up to help convey your vision. As the approach develops through iterations, it becomes a full proposal or business plan, which can include market positioning, cost, staffing, partnering, deliverables, a timetable and intellectual property (IP) protection. If you are developing a product, it must also include product specifications, manufacturing, distribution and sales. [3]

What are the client benefits of our approach? Each approach to a client's need results in unique client benefits, such as low cost, high performance or quick response. Success requires that the benefits be quantitative and substantially better - not just different. Why must we win? [3]

Why are our benefits significantly better than the competition? Everyone has alternatives. We must be able to tell our client or partner why our solution represents the best value. To do this, we must clearly understand our competition and their value proposition and our client's alternatives. [3]

### 2.2 Resilience of Built Infrastructure

Modern critical infrastructures include not only physical components, but also hardware and software. These integrated systems are examples of cyber-physical systems (CPSs) [4]. Very often, urban built infrastructures represent a critical node within the intertwined networks of an urban area. Despite the fact that a substantial part of our critical infrastructures today rely on complex systems of communication networks, there is just as much of a need to take into account the equally vulnerable built infrastructures of modern urban areas. Many of these, be it transport systems of different kinds,

large school/university campus areas, sports arenas or shopping malls have already been evaluated regarding their resilience against major terrorist attacks, school-shootings or disruptions of other natures. However, shortages in the emergency preparedness are common, e.g. with regard to shopping malls the following gaps have been found [5]: (1) Very little money has been spent to upgrade security since 9/11. (2) Training of mall security staff on preventing and responding to attacks remains inadequate. (3) Hiring standards for prospective security officers have not changed substantially since 9/11. (4) Risk assessments are rare, and emergency management plans are frequently developed without the input or participation of first responders.

Making large-scale built infrastructure in urban areas more resilient against attacks and disruptions of different kinds is an endeavor that requires multifaceted and multifunctional cooperation between various players of the security sector [5], [6]. In this case, resilience not only includes concepts and technologies to make built infrastructure more robust against attack and disruption, but also to integrate aspects such as energy efficiency, multi-functionality and overall sustainability of large-scale infrastructure.

The European construction industry (including civil engineering, architectural designs as well as building/construction) is already a strong player on the global market. Globally significant building projects of massive impact (Dubai, Shanghai, etc.) are often realized by European designers/builders.

### 2.3 Severe Violence in Schools

In the world, over 300 school-shooting cases are known and over ten cases where the perpetrator(s) have been prohibited to perform the attack at the last moment or earlier [7]. The definition of a school shooting is [9]: (1) a student or a former student brings a gun, a sword or a similar weapon, or explosives/flammable liquid to school with the intention of killing somebody, (2) the gun is discharged and/or weapons, liquids or explosives are employed, and at least one person is injured, and (3) the shooter attempts to shoot or otherwise kill more than one person, at least one of whom is not specifically targeted. All school-shooters have been males from eleven to roughly 25 years old [10]

A analysis about the minds and thoughts of school-shooters done in July-October 2009 over ten school-shooters from USA and one from Finland [11] reveals issues about the background, personality and mentality of the school-shooters that contributed to the committing of a school-shooting.

The study covers two different parties' research results on the persons of the shooters as well as possible warning signs for shootings. School-shootings are influenced by several factors; one being the psychological profile of the shooter. Other factors are e.g. family relations, school environment and social relationships. In [11] the focus is on the person who commits the school-shooting and his micro environment, which is family.

The backgrounds of the shooters do not give one direct and unified answer to why these specific students decided to go on a rampage in their school. The backgrounds and psychological qualities of the shooters vary widely. They are influenced by mental health problems, traumas and many other factors. Some of the shooter's problems seem to be created and exist only in their own minds, such as the conflicting reports by witnesses about the shooter not being bullied while the shooter himself has felt that he was bullied. [11]

No easy and quick answers exist when trying to recognize a school-shooter. Finding a shooter from a school community is like sniping blind folded. In preventing school-shootings the key issue is to create a sense of community and togetherness in a school. The students must have possibilities and means to vent their bad feelings in a controlled environment and seek help. One preventative measure is not enough but we need several measures that will form a safety net for recognizing the problems of the students and to offer help to them. [11]

A lot is discussed about how to deal with this issue. However, a large part of the discussion has been directed towards general problems in the society, cultural changes and of course how to react to the attacks when they occur and what to do afterwards. These questions have initiated a notable amount of different development projects. Consequently, not many of these projects have been concentrated on the tactical and operational level of prevention, specifically on precise and timely prevention of severe targeted school violence. [8]

Challenging accidents and criminal incidents such as school-shootings require effective action from all safety and security organizations involved. Many rescue and law enforcement operations require a transfer of information during a change of personnel responsible for the operation. This exchange is referred to as role shifting. The issue of transferring information and role-shifting during a multi-actor operation is a difficult question including effective decision-making, and managing related risks. [12]

### 3 Research Methods and Process

This case study has been deliberately designed to be part of a larger, mixed methods demonstration project 'Safe School Environment' within the 'Regional Innovation Ecosystems' work package of RYM Ltd's 'Energizing Society' program.

One aim of the larger study is to develop an integrated concept to improve the safety, security and resilience of large-scale urban developments. The project focuses on large-scale buildings, building complexes and building arrangements such as schools, shopping centers/areas, sports venues or combinations of business centers with underground transportation nodes. Safety, security and resilience against disasters should be included at the design and planning phase of such projects, leading to robust built infrastructure invulnerable to natural and man-made disasters. The project will take into account the state of the art of built infrastructure protection products as well as planning and engineering tools.

The target of this case study is to contribute to our knowledge of the phenomena of 'safe school environment'. An explanatory case study with regard to the construction project 'Opinmäki 1<sup>st</sup> phase' was conducted in order to gauge its merits as a world's safest school environment and understand how the different stakeholder roles functioned within it. In this study, the case study method of research was chosen because the original question needs an answer to the question "how" [13]. The original research question is: *RQ1- How to create a safe school environment that provides a platform for excellent school results and international business opportunities?*

The original research question is specified and divided into two sub questions: *RQ2 - What are the roles of different stakeholders in creating a safe school environment? RQ3 - What kind of unique advantages a safe school environment benefits different stakeholders?*

The unit of analysis of the case study is the concept how to create a safe school environment. The data collection was done through participatory observation, interviews and documents produced during the 'Security and Safety in Universities' project [6] realized in Laurea University of Applied Sciences in 2009-2010 as well as during the planning of 'Regional Innovation Ecosystems' work package and Opinmäki [14] 1<sup>st</sup> phase construction project. Exemplars of students, teachers, police, rescue services and other security professionals were interviewed. The data collected from documents include data from the 'Regional Innovation Ecosystems' work package plans, the

Opinmäki 1<sup>st</sup> phase project plans as well as the Security and Safety in Universities project materials; minutes of meetings of the steering group and project group, theses, project work and reports by students and Laurea personnel. The use of different research methods, such as the NABC-approach [3] and different sources of information was done to strengthen the validity of the study.

### 4 Empirical Context and Target

This chapter introduces the empirical context and target of this study. An introductory overview of the case study construction project Opinmäki (Learning Hill) is provided.

Opinmäki campus in the heart of the new Suurpelto city area in Espoo is an international and multicultural community which offers users of all ages possibilities to learn and to enjoy inspiring free time. The campus is an open and cooperative meeting place which is full of life every day of the year. Its premises can be used by all actors of the campus and residents of the Suurpelto area. Interaction between different language and cultural groups is characteristic to Learning Hill. The campus will include a Finnish primary school and an International school working in English. Also day care is offered in two languages. [14]

Premises of the campus will be built at two lots. In addition to school and day care also library services, adult education, cultural, sports, youth and residents' park activities are also offered at the campus. Multipurpose premises and equipment can be used by all the actors of the campus. Also yards, playgrounds and outside facilities are planned in such a way that everybody can use them. Common premises offer plenty of possibilities to a new kind of cooperation and synergy gains. [14]

The 1<sup>st</sup> phase of Opinmäki will be ready in summer 2014. It's scale is 9 500 hym2 and 14 800 brm2 and budget 43,0 million Euros without VAT. The total scale of Opinmäki campus will be circa 13 300 hym2. [15]

Within the negotiations with leading civil servants of City of Espoo, it is found out that developing Opinmäki as a world's most ecological and safe school environment, the reputation of T3 area as an innovative area will increase further. Also, its international attractiveness will increase more.

### 5 Research Findings

In this chapter the research findings of this study are presented. The chapter is largely based on the data gathered between 2009 and 2010. Comparisons are

made between the theoretical aspects raised in Chapter 2 and the information gathered in the empirical part of this study.

### 5.1 Safe School Environment Concept as a New Service Innovation

A safe school environment concept could be seen as a new service innovation. When categorizing research findings by bringing the NABC logic and presentation of value creation in the context of the Safe School Environment, the following observations could be made:

*Market needs:* Meeting the threat of severe violence in schools is all in a day's work for students, teacher and other actors. With the globalization trend, the threat will increase and spread all the more.

*Solution Approach:* Mobilizing the recommendations created within the Security and Safety in Universities project [6], a radical change will be born. It could formalize a new technological and service standard that offers significant opportunities to the line of business. Opimäki could be used as a proof of service concept prototype.

*Solution Benefits:* The new service concept which integrates the strength values of Finnish school system (publicity, transparency, equality and excellence) with safe school going in dynamic global environment. This combination offers an enormous global business potential.

*Competition:* So far, no total concepts are on the market; only isolated consultants and vendors of guides and security technologies. Finland is a compact community of good reputation based on trust and neighborhood, especially Finnish school system has made shining name for itself. Here, a new integrated service standard for safe school environment and strong educational system could be made.

### 5.2 Resilient School Infrastructures

School infrastructures represent a critical node within the intertwined networks of an urban area include not only physical components, but also hardware and software. However, a comprehensive approach to develop resilience concept for a combination of such systems, as they are often designed in modern urban areas, has not yet been approached thoroughly.

The strong position of European construction industry in global markets must be invigorated by the initiation of an integrated approach to better protect large-scale built infrastructure like schools. Obviously, such an effort offers a wide range of new

market opportunities for a wide range of European players. Evidently, this not only includes players developing genuine security technologies, but also requires smart and unconventional business solutions to bring together the different aspects addressed by the concept of resilience. This will ensure that aside from the already established players on the field, new and young SMEs can contribute to such an approach with their niche ideas and concepts.

A systematic approach to resilience enhancements for large urban built infrastructures begins at the design stage. Opimäki 1<sup>st</sup> phase is now at this stage. Key persons for success are the gatekeepers of architectural, electrical, communicational, pipe and other infrastructural designers and decision makers. These gatekeepers must have the powers to make amendments to plans in the course of the project affecting to the costs, also. In other words: normal vendor-supplier tendering rules do not apply in which all detailers regarding usability scenarios and their supporting structures and technologies are frozen on the date of tender.

Public-sector could utilize innovative procurement as a particularly effective demand-side mechanism for increasing private sector R&D activity, expenditure and output [16]. Opimäki is a potential subject of this instrument.

### 5.3 Roadmap for a Safe School Environment

Answering to the increasing threat of severe violence in schools, both technical and "soft" tools are needed. Integrating school safety and security, Finnish strong educational system and sustainable development, a new school concept could be developed. As a result of this case study, the following four years research roadmap is created.

Table 1. Research Road Map

Year	Service family	Technology family
2011	New global business potential (NGBP) is specified; agreements, working programme, international partners	Requirement analysis, consortium formulation
2012	Research and development phase of NGBP, outlining of standardization paths, proof-of-concept,	Piloting of the concept of a new innovative procurement
2013	Proof-of-value prototype, testing, de facto standardization	Developing technical solutions supporting the service family
2014	Proof of self-sustaining use, de jure standardization (if necessary)	Spreading of new technical solutions as a part of the service family

## 6 Conclusion

This chapter evaluates the research process and the findings of this study from the viewpoint of the research questions of the study. Finally, suggestions for future research avenues are made.

### 6.1 Answering the Research Questions

The main objective of this study was to provide an improved understanding of the structure and evolution of the safe school environment. The existing knowledge and the empirical data on the research topic were presented and evaluated. The following analysis summarizes the research work from the viewpoint of the research questions RQ1, RQ2 and RQ3 in this study.

The answer to RQ1 is to follow through a four years research road map that trails the path of service innovation development. Table 2 shows the answers to RQ2 and RQ3.

Table 2. Answers to RQ2 & RQ3

Stakeholder	Role	Unique benefits
City of Espoo	Building developer; Innovative procurement instrument user	Good reputation of the area; Innovation-friendly public procurement framework
Students, personnel, other users of the school	End-users	Safer operational environment
Service companies	Service providers	New global business potential
Security technology and construction companies	Developing technical solutions supporting the service family	New global business potential

### 6.2 Suggestions for Further Research

As being a proof-of-concept prototype, Opinmäki is a good opportunity to develop European standards for the safety and security of large-scale urban buildings, building complexes and building arrangements.

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