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# EARLY WARNING SYSTEMS – EMPIRICAL EVIDENCE

## SUSTAVI RANOG UPOZORENJA – EMPIRIJSKO ISTRAŽIVANJE

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### Ključne riječi:

*sustavi ranog upozorenja, operativno i strateško poslovno ponašanje, trendovi u menadžmentu, empirijsko istraživanje*

### Key words:

*early warning system, operating and strategic business behavior, trends in management, empirical evidence*

### SAŽETAK

Unatoč značaju sustava ranog upozorenja (SRU) u otkrivanju slabih signala pri promjenama okoline i doprinosa u unapređenju pravovremene poslovne pripremljenosti i odgovora na poslovne izazove, posebice u trenucima poslovne krize, empirijski podaci - prije svega na razini država - pokazuju kašnjenja u praksi u odnosu na teorijske prednosti SRU-a. Svrha ovoga znanstvenog rada jest doprinijeti praktičnim i teorijskim

### ABSTRACT

Despite the importance of early warning systems (EWS) in revealing weak signals on environmental changes and in constructing a solid base for timely and appropriate business response, particularly against the backdrop of business crises, empirical evidence - especially at the country level - still lags behind. **The aim of this paper is to contribute to the practical and theoretical knowledge about EWS by providing empirical evidence**

spoznajama o njemu u poduzećima putem empirijskog istraživanja provedenog na uzorku od triju europskih zemalja, tj. Hrvatske, Austrije i Grčke. Pretpostavljamo kako bogatije zemlje, mjereno prema terminima BDP-a, imaju viši stupanj implementacije SRU-a i češće koriste najsuvremenije, dok one s manjim BDP-om imaju nižu razinu razvoja i njihove implementacije. Nadalje, istraživanje je pokazalo uzroke neimplementacije SRU-a. U svrhu empirijskog istraživanja korišten je strukturirani upitnik. Unatoč postavljenoj hipotezi o razlikama među zemljama u razini BDP-a i razini implementacije SRU-a, ne postoje statistički značajne razlike među zemljama. Međutim među zemljama postoje određene razlike u vrstama i prioritetima SRU-a. Možemo konstatirati kako su oni u provedenom istraživanju uglavnom kratkoročno usmjereni, s naglaskom na operativnim ciljevima u poduzećima u sve tri zemlje. Glavni razlog njihove neimplementacije u poduzećima jest manjak zaposlenika i nedostatak menadžerskih inicijativa.

ce from companies located in three different European countries, i.e. Croatia, Austria and Greece.

We propose that companies in richer countries, as measured in terms of GDP, have a higher implementation level of EWS and are more likely to meet current state-of-the-art EWS standards while companies in the countries with a lower GDP show a lesser level of development. Moreover, we explore the reasons for not implementing EWS. For our survey we used a structured questionnaire. Contrary to our hypotheses, there are no significant differences among the countries concerning the level of EWS implementation. However, there are some differences as to the kind of EWS. Overall, EWS are predominately short-term oriented and operating in all three countries. The main reasons for not implementing EWS are the shortage of employees and the lack of management initiatives.

## 1. INTRODUCTION

The need for early warning systems (EWS) basically results from suddenly occurring incidents, i.e. the energy crisis in the late 1970s<sup>1</sup> or the 2008 global financial crisis that is striking for a broad range of reasons, including most obviously its speed (dynamic) and severity.<sup>2</sup> During the last decades, new and unexpected environmental trends and developments caught numerous firms unprepared and induced several forms of business crises. According to literature, companies' reactions to such crises were basically two-fold: companies either managed to recognize emerging environmental signs in time and interpret them in an appropriate way or they failed to correctly assess their importance and, thus, totally ignored them.<sup>3</sup> It is well-acknowledged that by recognizing and uncovering the signs of a crisis in time, companies may be able to avert the crisis or at least minimize both potential negative effects and the time span of the crisis. Indeed, there are findings in research which support the view that signs of a business crisis manifest themselves already about four years before the crisis becomes apparent or before the effects of the crisis are felt by companies in one way or another.<sup>4</sup>

EWS are among the most important and most prominent tools used for assessing environmental challenges, chances and threats, and for simultaneously enhancing appropriate reactions in a timely manner.<sup>5</sup> Since the severity and the speed of environmental changes may vary from country to country, the need for and the requirements to use EWS might differ, too. Thus, the EWS should be and are implemented against a country-specific background in order to gain competitive advantages.<sup>6</sup> Despite the increased attention that the concept of EWS has received in recent decades, there is no common standard with regard to the importance or the organization of EWS in different countries. This is mainly due to the fact that the conceptualization of the term depends on a number of country-specific characteristics, such as the level of awareness at the micro and macro, country level, the per-

ceived importance and, further, the know-how, know-what, know-who and know-when dimensions involved in the EWS implementation phase. Furthermore, there is limited empirical evidence in this area, particularly at the country level.

**The aim of the present paper is to fill this gap by empirically exploring the perception of EWS concerning their characteristics, importance and role in companies located in three European countries, i.e. Austria, Croatia and Greece.**

It is not our aim to statistically report on the way the adoption of EWS tools is associated with the surveyed companies' characteristics but to explore country differences. To this end, we propose that companies in more mature countries (i.e. those with a higher GDP, more advanced development of business practices) have a greater EWS implementation level and are more likely to meet the current state-of-the-art EWS standards while companies in less mature countries (i.e. those with a lower GDP, poorer development of business practices) show lower EWS implementation levels. Moreover, we explore the reasons discouraging the companies in these three countries to implement EWS. Our survey is a first attempt at capturing the way in which the EWS are conceived by practitioners in the context of different European countries. The results of our survey should provide valuable insights not only for further research but also to the practitioners who are in charge of and work with EWS in various industry groups and government agencies, particularly those involved in cross-country organizational structures and business relationships.

The remainder of the paper is structured as follows: Section 2 provides the theoretical background on EWS by outlining major characteristics, elements and the role of EWS in current business practice. The hypotheses are developed in Section 3. Section 4 describes the research method and the survey process. The results of the empirical survey are presented in Section 5. Section 6 discusses the results and outlines some implications for theory and practice. Finally, the limitations of the survey and a brief outlook are given.

## 2. THEORETICAL BACKGROUND

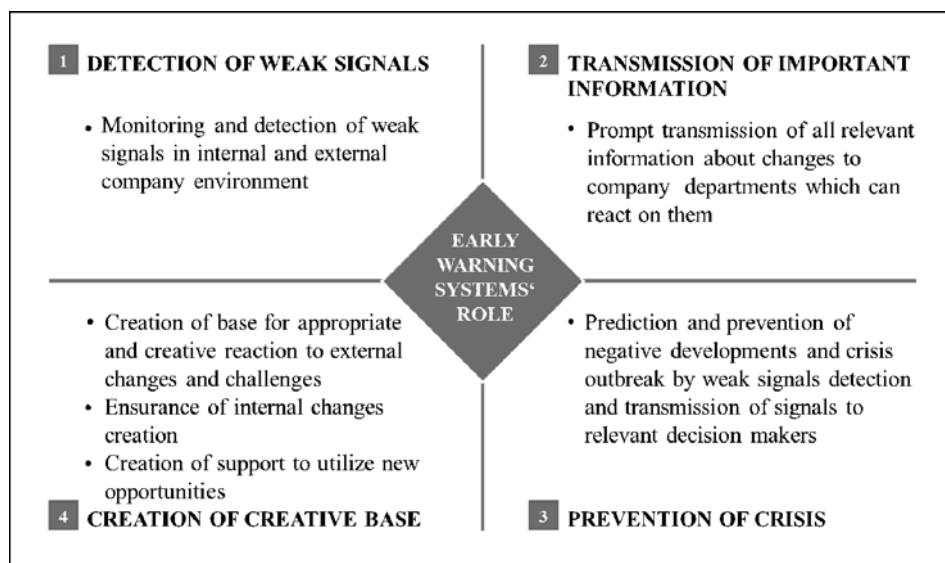
### 2.1. Characteristics of EWS

The concept of strategic EWS was first introduced in business literature by Ansoff.<sup>7</sup> It coincided with such concepts as strategic issues management and trends management. Ansoff based his proposition for strategic EWS on the realization that discontinuities in the technological, economic, social and political environment of businesses appear neither at random nor unpredictably. In particular, he claimed that since such discontinuities are mobilized by humans and in accordance with their interests, they are presumably spotted by means of weak signals reflected in business environments. "Weak signals" are inadequately defined and vaguely structured information, which forewarns the occurrence of strategic discontinuities due to changes in environmental trends (e.g. changes in consumer behavior).<sup>8</sup> While strong signals are sufficiently visible and concrete, weak signals are imprecise early indi-

cators about pending impactful events.<sup>9</sup> Companies that continuously monitor their environment and keep an eye on weak signals are better equipped to anticipate changes and are familiar with emerging challenges, which are not perceived as unexpected situations but rather as foreseen events. If weak signals are recognized in time and are properly interpreted, adequate precautions might be taken in advance.<sup>10</sup>

In this context, the role of EWS consists in predicting the timing of relevant environmental developments<sup>11</sup> and in increasing a company's flexibility to quickly adjust its internal structures to changes in the environment.<sup>12</sup> These changes might be threats as well as opportunities.<sup>13</sup> One of the major tasks of a EWS is to monitor and detect the aforementioned weak signals in the company's internal and external environment. The information on weak signals it gathers has to be transmitted to relevant decision-makers, who should be able to make appropriate decisions in the best interest of the entire company and take preventive actions. However, the role of EWS is not limited to displaying environmental change in a company's financial indicators only but is also concerned with the identification of the causes

**Figure 1:** Key roles of early warning systems (EWS)



Source: Bickhoff, N. Blatz, M., Eilenberger, G., Haghani, S., Krause, K.-J. (Eds): **Die Unternehmenskrise als Chance, Innovative Ansätze zur Sanierung und Restrukturierung**, Springer, Berlin, 2004, pp. 5-10.

of such changes. In addition to this kind of backward analysis, EWS are also oriented towards the future. By assessing possible consequences on the company and acknowledging future changes, it may be easier and more likely to initiate appropriate and effective counter measures. Finally, since EWS force decision-making managers to deal with external opportunities and threats on the one hand and internal strengths and weaknesses on the other, managers become more sensitive to changes and are more likely to develop creative capabilities directed towards restraining and avoiding threats as well as towards positively responding to opportunities.<sup>14</sup> Figure 1 summarizes the role and tasks of EWS.

First approaches to EWS date back to the 1960s and primarily to the field of international politics. Thus, they were initially envisioned as a tool for predicting political changes, especially the geopolitical crises, and were developed for the purpose of strategic planning. The starting point of EWS is often seen in Aguilar's concept of environmental scanning that is part of the strategic issue management and directed at the future orientation of a company's development.<sup>15</sup> As shown in Figure 2, there are three major generations of EWS, commonly distinguished in literature.<sup>16</sup>

While EWS of the first and second generation were predominately oriented towards the internal aspects of companies and its operational issues, the area of interest has broadened steadily in the past few decades. At the very beginning

of EWS, only a limited number of quantitative key performance indicators for planning and control were implemented in order to reveal any deviations between planned and emergent figures. Thus, the first generation of EWS was strongly inspired by traditional information and control systems; hence, a further development of traditional management accounting practice.<sup>17</sup> This point of view was extended by the second generation of EWS which added predominately quantitative early warning indicators in order to reveal risky and/or promising developments before their effects became apparent to the company. The crucial incentive for the last generation of EWS came from the previously mentioned concept of weak signals by Ansoff.<sup>18</sup> Weak signals and strategic, relevant information must be assessed and utilized in order to reveal potential risks and opportunities both within the company and in its immediate and wider environment. Furthermore, there must be appropriate reactions to the identified signals.<sup>19</sup> In contrast to the early approaches, which are subsumed under operational EWS, last generation EWS are characterized by a stronger focus on strategic issues, with early warning indicators both quantitative and qualitative in nature. Some references distinguish between third and fourth generation EWS, where the fourth generation is a bit more focused on a holistic perspective of prior approaches while also dealing more explicitly with the link between strategic and operational issues and with methodological guidelines for practical purposes.<sup>20</sup>

**Figure 2:** Generations of EWS

Period	1960s	1970s-1980s	1990s and onwards
Area	Within the firm	Firm and closer environment	Firm, closer environment and wider environment
Dominant aspect	Quantitative	Quantitative	Quantitative and qualitative
Type of information	Key performance indicators of planning and control	Early warning indicators	Early signals, strategic radar
Goal	Spotting deviations from the plan and the exceeding of thresholds	Gathering and assessing of information in operating business	Gathering and assessing of relevant strategic information

Source: Horvath, 1991, pp. 421-422; Gleißner and Fuser, 2002, pp. 226-227; Welge and Al-Laham, 2008, pp. 433-435 (modified)

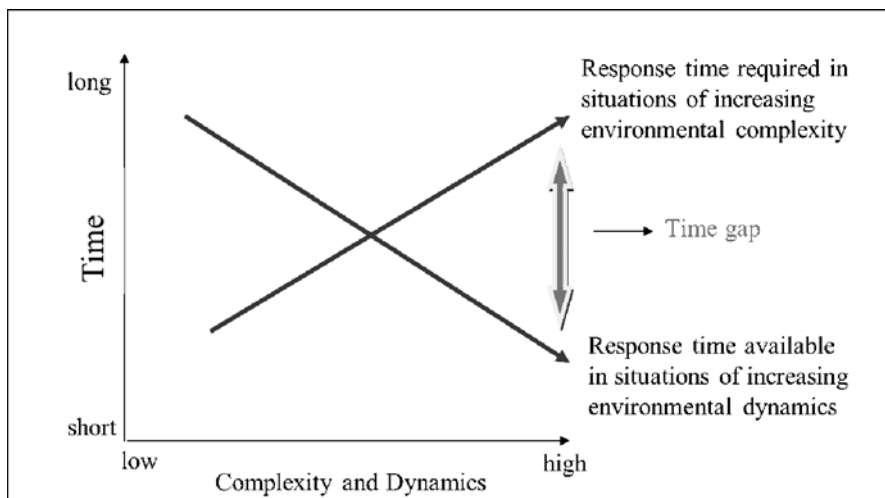
## 2.2. Relevance of EWS in current business practice

The need for third generation EWS basically results from discontinuities, environmental dynamics and strategic surprises.<sup>21</sup> In fact, due to the internationalization of global economic activities and world capital economic flows, today's companies face a highly complex, dynamic and, thus, unpredictable environment. In this context, complexity and dynamics are twofold: First, there are somewhat "regular" environmental conditions. Burkhart,<sup>22</sup> for example, refers to the fact that a firm's life cycle stages are important when assessing the complexity and dynamic as well as the influence of the environment on the firm. Furthermore, some industries such as the IT industry exhibit a very short life cycle time span and, consequently, firms operating in this industry face high turbulences. By contrast, the situation in the automobile and the airplane industry regarding life cycle time span is somewhat more stable. Second, there are selective incidents that impose a sudden and unforeseen pressure on firms. Such suddenly occurring incidents, e.g. the 2008 global financial crisis, are particularly striking for a broad range of reasons, including most obviously their speed (dynamic) and sever-

ity.<sup>23</sup> Independent of the source of complexity and dynamics, the amount of time available to identify weak signals and to react in an appropriate way decreases with complexity and dynamics while, simultaneously, more time is required to recognize all dimensions and consequences of specific decisions. As shown in Figure 3, a considerable "time gap" between the time required for efficient decision-making and the time available must be assumed. The more complex and dynamic a firm's environment is, the more difficult it is for the firm to adjust to changes and the more intense the pressure placed upon EWS to close that time gap.

Having said that, a crucial factor for the effectiveness of EWS with regard to the prevention of business crises and to taking advantage of new opportunities is apparently time.<sup>24</sup> In this context, time refers to the time span between the occurrence of an incident and its perception by the firm. As time goes by, the information on possible opportunities and threats increases and signals become stronger; simultaneously, the range of possible actions and their scope decreases while the costs of action increase.<sup>25</sup> Since the available knowledge and the awareness of both "regular" environmental changes and suddenly occurring incidents, such as crises, determine the strategy

**Figure 3:** Time gap



Source: Bleicher, 2011(modified)

response and its applicable range, the sooner a firm recognizes the signals which indicate a crisis, the better positioned it is to maneuver and the less damaging the impact of the crisis on the firm's sustainability. When decision-makers are given enough time to consider and initiate the largest possible number of appropriate counter measures, more time will presumably be spent on strategic and operational business planning and, thus, significant losses and missed business opportunities may be avoided.<sup>26</sup>

### 3. HYPOTHESIS DEVELOPMENT

Crises, such as the aforementioned 2008 global financial crisis, affect countries and their businesses to different extents. Although various research efforts have been made to explain the causes of a global (financial) crisis, there is no clear evidence yet that the severity of a crisis differs across countries.<sup>27</sup> Nonetheless, it must be expected that the challenges from crises and environmental changes are realized and experienced in different ways and with different impacts, according to the firm's country-specific background. Country-related crisis correlates used in literature include country-specific characteristics, such as the financial policy, financial conditions, international imbalance, macroeconomic policies, institutional factors, geography.<sup>28</sup> Countries with a lower GDP level, GDP per capita and GDP growth rate, with a weak economy and high rates of unemployment, i.e. Croatia and Greece compared to Austria, are more often observed to come off worse in crises. This may be explained by the fact that these countries tend to be more dependent on imports and more widely exposed to spillover effects from the crises affecting other countries.<sup>29</sup> Furthermore, since limited human and financial resources represent a critical barrier to the implementation of the risk management systems such as EWS,<sup>30</sup> countries with lower GDP levels presumably do not attain state-of-the-art business practices due to the lack of necessary resources. Although there is a

higher pressure from crises on those countries and a greater need for counter-measures such as EWS, richer countries, i.e. Austria compared to Croatia and Greece,<sup>31</sup> have an advantage over the countries with a lower GDP in responding to crises.<sup>32</sup> Countries with a higher GDP level are more likely to have larger funds available to tap into in times of need as well as more resources and means to meet upcoming challenges, particularly in financial terms, as regards the time pressure etc. On the other hand, they are assumingly more likely to have state-of-the-art EWS business practices in place. Thanks to a more advanced country development and prosperity, companies in these countries may have existed longer and accumulated more experience, for example, concerning the implementation of various management systems and practices such as EWS. In view of these considerations, it can be assumed that the level of development and implementation of EWS differs across countries, even among the companies that have their operations in different European countries. Thus, we define our first hypothesis:

*Hypothesis 1: Companies in the countries with a higher GDP level, i.e. Austria, show a higher level of EWS implementation than companies in the countries with a lower GDP level, i.e. Croatia and Greece.*

Concerning the kind of EWS, we refer to the three generations of EWS presented in Section 2 and, thus, roughly distinguish operational, short-term EWS from strategic, long-term EWS. The former kind corresponds to the first and second generation of EWS and, thus, is traditionally designed for control purposes and management accounting in operational management practice.<sup>33</sup> Operational EWS are implemented with the help of special information systems, which signal the latent opportunities or threats by means of predominately quantitative information. They include short-term concepts and tools, such as the balance sheet, planning activities at a weekly, monthly and annual level, financial indicators (i.e. economic, profitability, liquidity indicators), monitoring and control.<sup>34</sup> In contrast to the operational management practice, the strategic



management practice uses strategic EWS and follows a rather long-term perspective with the aim to develop and maintain potentials for future success.<sup>35</sup> The purpose of strategic EWS is to identify the aforementioned weak signals well in advance, to make strategic discontinuities and strategic surprises assessable and to predict them before negative consequences become even visible. Consequently, strategic EWS aim at enhancing the active management of risks and opportunities. The information that is relevant in strategic EWS is both qualitative and quantitative. The most prominent concepts and tools used in strategic EWS include environmental, industry and market analysis, management analysis, potential analysis, SWOT analysis, Balanced Scorecard and risk management.<sup>36</sup> Correspondingly to Hypothesis 1, we assume that companies in the countries with a higher level of development are also more advanced with regard to business practices. Thus, we define our second hypothesis:

*Hypothesis 2: Companies in the countries with a lower GDP level, i.e. Croatia and Greece compared to Austria, are more likely to use first and second generation EWS, or predominately short-term and operational EWS, while companies in the countries with a higher GDP level, i.e. Austria compared to Croatia and Greece, are more likely to use third generation EWS, or both operational, short-term EWS and strategic, long-term EWS.*

In order to show the occurrence of change and the development of new trends in the short- and long-term perspective while announcing an upcoming crisis before its effects become apparent and initiating early strategic interventions in operational and strategic business practice, early warning indicators are mostly applied. Early warning indicators are auxiliary values for identifying risks and opportunities in early stages. They are expected to meet such requirements as singularity, completeness, timely availability of information and economic justification.<sup>37</sup> Companies usually consider several fundamental indicators which they see as crucial and vital for their business survival.<sup>38</sup> The operational

management is directed towards short-term key performance indicators, such as liquidity and profit, liquidity planning, incoming orders indicator, leading products indicator, indicators of business climate and employees.<sup>39</sup> In accordance with the explanations provided in Section 2 and correspondingly to Hypotheses 1 and 2, we assume that first and second generation EWS focus predominately on quantitative, short-term early warning indicators that primarily portray the firm and its immediate environment. By contrast, third generation EWS have an extended view, incorporating the firm and its immediate environment as well as a wider environment of the firm. For this reason, a broader range of indicators is incorporated and both quantitative and qualitative early warning indicators are included in the EWS. On the basis of these assumptions, our third hypothesis is split in two parts:

*Hypothesis 3a: Companies in the countries with a lower GDP level, i.e. Croatia and Greece compared to Austria, are more likely to use very few early warning indicators while companies in the countries with a higher GDP level, i.e. Austria compared to Croatia and Greece, are more likely to use a larger number of early warning indicators.*

*Hypothesis 3b: Companies in the countries with a lower GDP level, i.e. Croatia and Greece compared to Austria, are more likely to use financial early warning indicators only while companies in the countries with a higher GDP level, i.e. Austria compared to Croatia and Greece, are more likely use a broader range of early warning indicators.*

## 4. RESEARCH METHOD AND PROCESS

The aim of our research was to investigate the country-specific role and importance of EWS on the one hand, and the state-of-the-art advance of implemented EWS in companies located in three selected European countries on the other hand. The hypotheses defined above are based

on the fundamental assumption that business practices differs across countries with regard to EWS because of the differences in the countries' general level of development and economic strength. For this purpose, we conducted a large scale empirical survey, using a traditional questionnaire. Since the results presented in this paper are a part of a wider field of study on entrepreneurial firms concerning the role of controlling in the area of tension between profit and sustainability, the entire questionnaire consisted of a broader range of items than those reported here. In total, there were 43 closed questions. For the purpose of the present research, we extracted only nine questions, of which five focus on EWS and related issues and four questions deal with demographic issues. The questionnaire was developed by the authors of the paper according to the research objectives and using the support of six co-researchers, who are experts in particular fields and who added three to four questions each in their field of expertise. The questionnaire had not been used in previous studies by the authors or by the other researchers. There are three types of questions: (1) multiple response questions, where each question had several possible answers, of which either only one answer or multiple answers could be chosen, (2) yes-or-no questions and (3) rating questions, which had to be answered on a 5-point Likert scale. The scales were developed by the authors according to the aim of the survey and the research hypotheses.

The empirical research was conducted in companies in Austria, Croatia and Greece throughout 2010 and early in 2011. The questionnaires were distributed by electronic mail. Participants were informed that the survey was totally anonymous and that its results would be used for the purpose of scientific research only. In the course of 2010 and in early 2011, with a few iterations, we received a total of 126 questionnaires, i.e. 16 from Austria (94% response rate), 31 from Greece (89% response rate), 79 from Croatia (8.78% response rate). The questionnaire was predominantly answered by the managers in charge of controlling and finance, particularly in Austrian and Croatian companies. In Greek companies there

were a considerable number of respondents in other positions as well as board members and presidents. Thus, the majority of respondents in our survey have to deal with EWS in practice and are, hence, familiar with the subject. In this sense, they appear to be in charge of the monitoring and implementation of several types of EWS, even though in the Greek sample, the respondents are in different managerial positions than in Croatian and Austrian sample.

In preparing the results, a number of scientific research methods using SPSS were applied, in particular frequency statistics, analysis of variance (Anova) and Chi square tests.

## 5. RESULTS

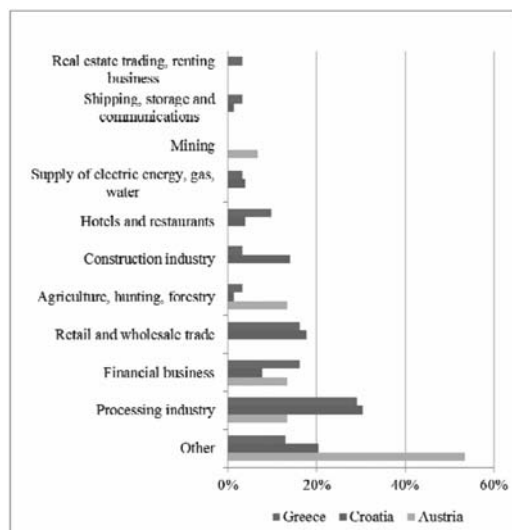
Below, we present the results of our survey. First, we give an overview of the profile of the companies that took part in our survey. Thus, we report their main business activity, company size, ownership structure and respondents' position within the company. By providing such detailed information, we shed further light on country-specific characteristics and aim at corroborating differences among the countries that are assumed on the basis of economic data, as outlined in Section 3. Second, we test the hypotheses elaborated above. Third, additional evaluations provide further explanations concerning both confirmed and rejected hypotheses.

### 5.1. Company profile

Across all three countries, most respondents worked in the processing industry (28%), retail and wholesale (15%) and in the financial industry (10.5%). However, when asked about their business activity, almost one quarter of the companies indicated "other", including e.g. public service and defense, social insurance, education, healthcare, community and personal services. As shown in Figure 4, various industries of the

respondents are not equally distributed in the three countries. Construction industry is more strongly represented in the Croatian sample but less frequent in the Greek sample and completely missing in the Austrian sample. The processing industry is slightly less frequent in the Austrian sample while the hotel and restaurant industry as well as the financial industry are more dominant in the Greek sample. Both these industries appear to be less frequent in Croatia and Austria.

**Figure 4:** Business activity of respondent companies



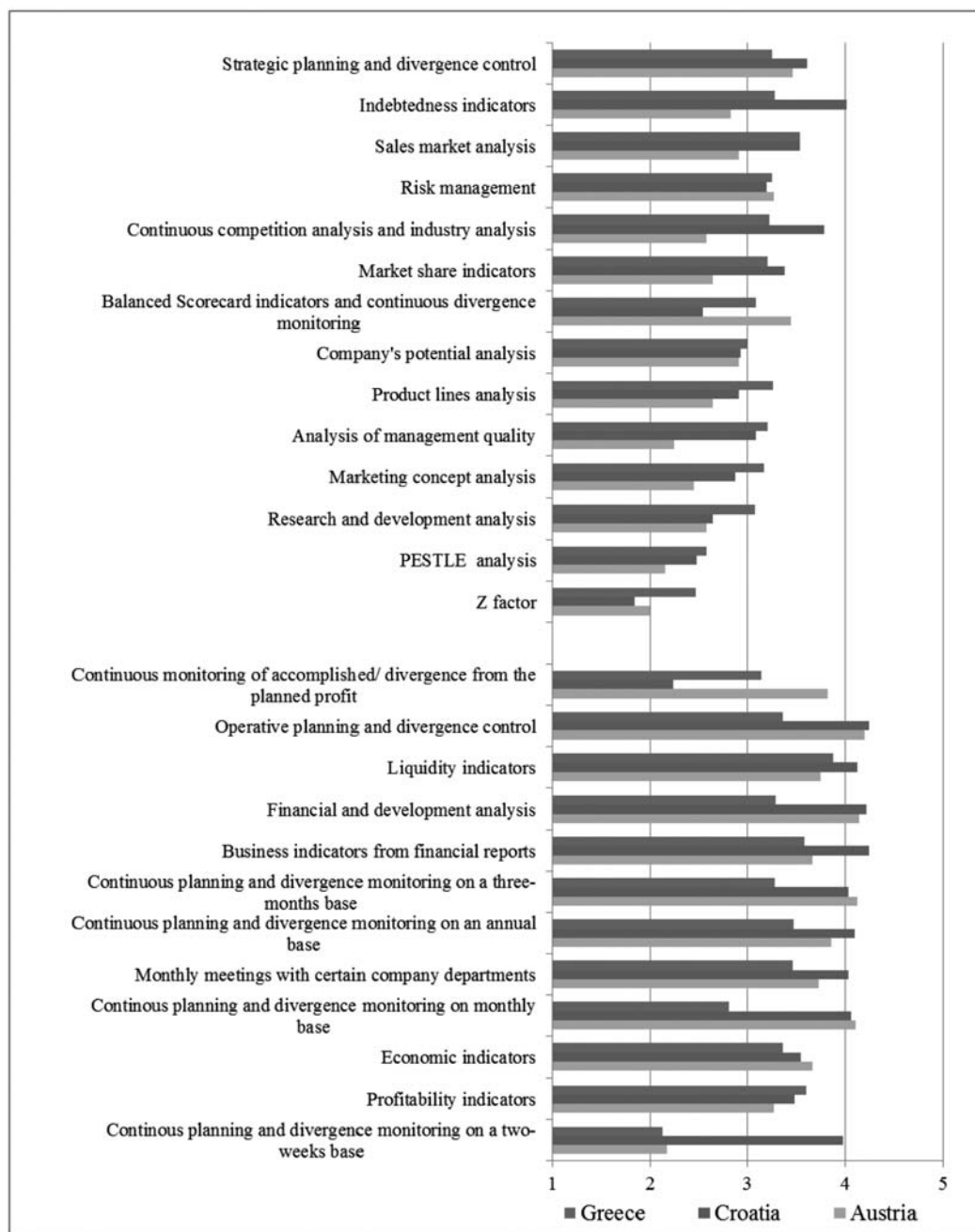
To classify companies with regard to their size, we adopted a definition issued by the European Union in the Commission Recommendation 2003/361/EC which is based on the staff headcount and turnover, or on balance-sheet total. A small company is defined as a company which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million. A medium-sized company is defined as a company which employs fewer than 250 persons and whose annual turnover does not exceed EUR 50 million or whose annual balance-sheet total does not exceed EUR 43 million. According to this definition, most companies in our sample can be defined as large companies with more than 250 employees. On average, about 48% of all companies in

the sample across all three countries were large companies and about 20% were small companies with fewer than 50 employees. In this respect, we identified some differences among the three countries. Namely, the Croatian and the Austrian sample were dominated by large companies (58% and 43%) while the Greek sample included mostly small companies, accounting for 39% of the total surveyed, compared to 21% in the Austrian and only 13% in the Croatian sample. A Chi square test showed the differences among sample countries to be significant ( $\chi^2 = 11.334$ ,  $df = 4$ ,  $p = .023$ ).

Besides company size, the ownership structure also varied considerably among the three countries. On average, private (local) and mainly private (local) companies were represented with around 63% in our sample while both privately owned foreign companies and state-owned companies represented around 16% of the total. Companies in the Greek sample, however, were almost exclusively local and privately owned (90%) and, thus, differed considerably from the companies in the Croatian and the Austrian sample which were quite similar with regard to the ownership structure. In contrast to the Greek sample, only around 45% of both the Croatian and the Austrian sample was accounted for by local, privately owned companies, with 27-33% privately owned but foreign companies and 20-25% (mainly) state-owned companies. There were no state-owned companies in the Greek sample. Although these differences are significant according to a Chi square test ( $\chi^2 = 18.749$ ,  $df = 4$ ,  $p = .001$ ), they were not surprising because the major part of the Greek sample consisted of small companies, which are presumably privately owned.

## 5.2. Hypotheses testing

In Hypothesis 1 we stated that companies in the countries with a higher GDP level, i.e. Austria compared to Croatia and Greece, show a higher level of EWS implementation than those in the

**Figure 5:** Type and importance of implemented EWS

(1=not implemented at all, 5=fully implemented)

countries with a lower GDP level, i.e. Croatia and Greece compared to Austria. The results of our survey revealed that more than a half of the companies across all three samples had implemented

EWS. The same was true for each country, where even more than 60% of the companies in the Croatian sample indicated that they implement EWS, compared to 53% in the Austrian and 53%

in the Greek sample. A Chi square test revealed no significant differences among the three countries ( $\chi^2 = .890$ ,  $df = 2$ ,  $p = .641$ ). Consequently, our first hypothesis was not supported.

In Hypothesis 2 we argued that companies in the countries with a lower GDP level, i.e. Croatia and Greece compared to Austria, are more likely to use first and second generation, that is, predominately short-term and operational EWS while those in the countries with a higher GDP level, i.e. Austria compared to Croatia and Greece, are more likely to use third generation – both operational, short-term EWS and strategic, long-term EWS. In **Pogreška! Izvor reference nije pronađen.** 5 the frequency of strategic EWS instruments is presented in the upper half of the diagram while the frequency of operational EWS instruments is presented in the lower half. On average, the latter are more frequently used by companies in all the three countries. Thus, the instruments and analyses used in practice more likely correspond to the EWS of earlier generations than to the current state-of-the-art. Exploring the differences among countries, an Anova test (see Appendix Table A 1) reveals significant differences with regard to three operational instruments and one strategic instrument only: First, Croatian companies execute continuous planning and divergence monitoring significantly more frequently on a two-weeks' basis than do Austrian and Greek companies. Second, on the contrary, Croatian companies engage significantly less frequently in a continuous monitoring of accomplished profits and of the divergences from planned profits while Austrian companies pay most attention to this kind of EWS-element. Third, financial and development analysis are significantly more prominent in Croatian and Austrian than in Greek companies. Finally, at the strategic level, indebtedness indicators are used predominately by Croatian companies and to a lesser extent by Austrian and Greek companies. Although significant differences among these countries concerning the type of EWS elements used are apparently rare, some tendencies have been revealed. Concerning the aforementioned quantitative short-term orientation, Greek com-

panies can be said to be a bit less engaged in this field than Austrian and Croatian companies. Furthermore, contrary to our expectations, results indicate that Croatian and Greek companies show a slightly higher level of EWS implementation than Austrian companies. Surprisingly, Austrian companies tend to care slightly less about strategic instruments, such as the analysis of management quality, continuous competition and industry analysis, marketing concept analysis and product line analysis. Finally, Croatian companies in particular tend to be more concerned about both short- and long-term EWS elements and about operational and strategic EWS elements. Consequently, our second hypothesis was not supported.

Our third hypothesis was split into two parts. We proposed that companies in the countries with a lower GDP level, i.e. Croatia and Greece compared to Austria, are more likely to use (a) fewer early warning indicators and (b) predominately financial early warning indicators while companies in the countries with a higher GDP level, i.e. Austria compared to Croatia and Greece, are more likely use a larger number and a broader range of early warning indicators. With regard to the quantity of indicators used, companies of the Austrian sample indicated that they use more than ten indicators (see Figure 6 and Appendix Table A 2) significantly more frequently than Croatian and Greek companies. On the contrary, Greek companies rarely use more than ten indicators. Thus, Hypothesis 3a was supported.

Concerning the type of early warning indicators (see Figure 6), financial indicators are apparently the type of indicators that is most frequently used in the process of planning, control and reporting across all three countries. Most participating companies use five to ten financial indicators, and these are significantly more frequently used by Greek companies. Thus, the financial point of view dominates in EWS in all the three countries. With regard to the indicators other than financial, the majority of companies use fewer than five indicators. There is only one exception: around 50% of the Greek companies predominately use

five to ten market and consumer indicators. Overall, however, Greek companies use non-financial early warning indicators less frequently than do Austrian and Croatian companies. Business process indicators are predominately used in Austria while employee and innovation indicators are significantly more frequently used by Croatian companies. Since Greek companies differ significantly from Austrian and Croatian companies, with no apparent difference between the latter two, Hypothesis 3b was partly supported.

agree about some reasons. As shown in Figure 7, respondent companies in Austria, Croatia and Greece were unanimous in stating that there are not enough employees to monitor and analyze early warning indicators. Furthermore, most companies believed the financial indicators currently used in reports to be sufficient. While Greek and Croatian companies complained about the lack of management initiative, Austrian companies regarded it as a minor problem. They rather referred to the difficulties in integrating strategic

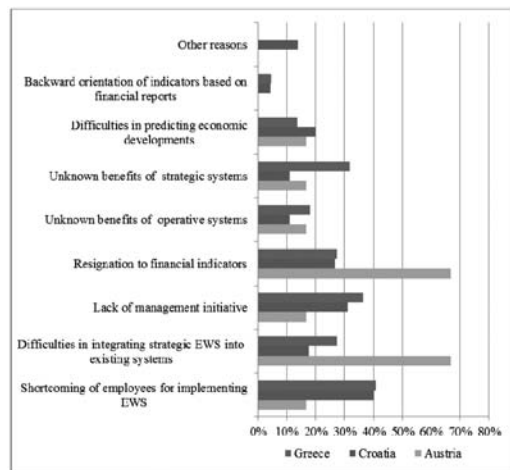
**Figure 6:** Relevant indicators in planning, control and reporting (response frequencies in %)

INDICATOR	Austria			Croatia			Greece		
	<5	5-10	>10	<5	5-10	>10	<5	5-10	>10
<b>Financial indicators</b>	23%	46%	31%	24%	38%	38%	37%	44%	19%
<b>Market/consumer indicators</b>	50%	20%	30%	65%	23%	12%	39%	52%	9%
<b>Business process indicators</b>	40%	20%	40%	68%	19%	13%	55%	41%	5%
<b>Employee indicators</b>	85%	15%	0%	66%	30%	4%	73%	23%	5%
<b>Innovation indicators</b>	100%	0%	0%	94%	3%	3%	74%	23%	5%

### 5.3. Additional evaluations

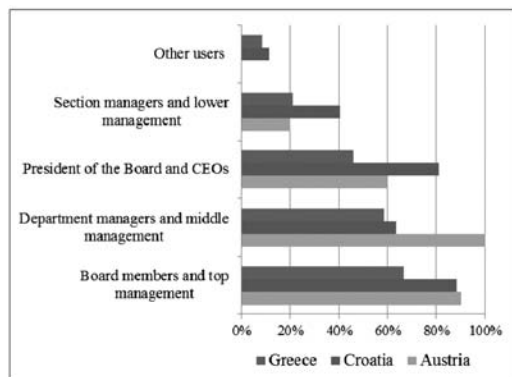
In some additional analyses we aimed at exploring why companies do not implement EWS. Companies in all the three countries completely

**Figure 7:** Main reasons for not implementing EWS



EWS into existing systems. Greek companies also indicated the benefits of strategic systems for the company to be largely unknown. Overall, Austrian companies apparently find the largest number of reasons for not implementing EWS while Croatian companies indicated fewer reasons for it on average compared to the Austrian and Greek sample. Even though our survey revealed a lack of management initiative, board members and top management were found to be the main EWS users in Greek and Croatian companies. In Austrian companies department managers and the middle management are a little bit more engaged in EWS although, overall, managers and board members are apparently most involved in EWS in Austrian companies if compared to Greek and Croatian companies. As Figure 8 indicates, section managers and lower management as well as the president of the board and CEOs are comparatively more involved in EWS in Croatian than they are in Greek or Austrian companies. Thus, we may assume that EWS are viewed from a more holistic perspective by integrating a higher number of management levels in Croatian companies.



**Figure 8: Users of EWS**

## 6. DISCUSSION AND CONCLUSION

Our research was directed towards providing empirical evidence in business practice with special regard to EWS in three selected European countries, i.e. Austria, Croatia and Greece. The aim was to explore differences in the level of EWS development as well as in the perceptions and attitudes of respondents against the background of their respective country. Since our survey is a first attempt at capturing the way in which EWS are conceived by practitioners in the context of different European countries, we consider our results preliminary and exploratory.

We defined three major hypotheses. First, we proposed that companies in more mature and richer countries, e.g. with a higher GDP level (i.e. Austria compared to Croatia and Greece) have a higher EWS implementation level. Second, we aimed at verifying that companies in richer countries are more likely to meet current state-of-the-art EWS standards, that is that they use third generation EWS. Third, subsequently to Hypothesis 2, we assumed that companies in the countries with a higher GDP level presumably apply third generation EWS and use both a larger number and a broader range of early warning indicators.

Contrary to our assumptions, the EWS implementation level does not differ among Austrian,

Croatian and Greek companies in our sample. Thus, the countries with a lower GDP level do not lag behind the countries with a higher GDP. An explanation might lie in the fact that a higher pressure from crises on the countries with a lower GDP and a greater need for counter-measures such as EWS push the companies in these countries to improve their business practices and implement EWS. Since the countries with a lower GDP level are traditionally known to be hit worse by crises, this finding might possibly indicate promising future prospects for both companies and individuals in Croatia and particularly Greece.

Similar assumptions are possible about future developments with regard to the kind and importance of various EWS elements. Companies of all three country samples showed a tendency towards a short-term perspective and an operational approach to EWS. Although current state-of-the-art business practices includes both operational and strategic elements, the latter are still largely ignored by most of the surveyed companies. Surprisingly, though, Croatian and Greek companies appear to be more engaged in any kind of EWS element than Austrian companies even with regard to the strategic business practice, where Austrian companies see particular problems concerning the integration of strategic EWS into existing systems. Thus, again we may possibly assume that companies in the countries with a higher GDP level do not dominate over those in the countries with a lower GDP level when it comes to the organization of EWS. However, we also identified some differences. Austrian companies seemed to be a bit more familiar with EWS by using more of them; but, like their Croatian and Greek counterparts, they also believed the financial indicators currently used for reporting to be quite sufficient while also seeming to be slightly more open to qualitative approaches than Greek companies in particular. We might explain this probably by the fact that Austria is slightly closer to other Western countries in economic terms and, thus, may be more inspired by the advances in business practices. Since Austrian and Croatian companies establish EWS and early warning tasks right at the top of

the company, we might expect enhancements in the EWS organization and implementation to be more promising in these countries. By contrast, it appears to be more problematic in Greek companies, which lag behind both in terms of the level of development and the recognition of potential benefits of (strategic) EWS.

Although the results of all conducted analyses consistently point to slight differences between Greek companies on the one hand and Austrian and Croatian companies on the other hand, there are some limitations to our survey. First, the Greek sample consisted of an above-average number of small, predominately privately owned and local companies while the Austrian and Croatian sample were dominated by large companies. This might account for some distortions in our results. Second, the country samples were somewhat unbalanced with regard to the number of participants, business activity of surveyed companies, company size and ownership structure. Future research is recommended to build on an equal contribution from each country.

Overall, however, the research showed a considerable potential to enhance the implementation of

EWS in companies in all the three countries since 40-50% of the surveyed companies have not implemented EWS yet. With the lack of employees to run EWS, monitor and analyze early warning indicators as the most cited reason for this deficit, human resource managers may be required to set initiatives. Apart from that, what also appears to be required is a change in the reasoning on the part of leading decision-makers in companies. Due to the fact that a lack of managerial initiative prevents most companies from implementing EWS, a fundamental reconsideration at the top level would encourage prospective instruments and actions with regard to this issue. Further recommendations arising from our results relate especially to the challenges in education and know-how with a view to raising the awareness of the need for a wider implementation of EWS and an integrative business management that balances between operational and strategic business orientation. These recommendations are predominately addressed to the main users of EWS, as identified in our survey, but also to other practitioners in various industry groups and government agencies, in particular to those who are involved in cross-country organizational structures and business relationships.

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## APPENDIX

**Table A:** ANOVA test - Country, type and importance of EWS

	<b>F</b>	<b>p</b>
<b>Strategic, long-term elements of EWS</b>		
Strategic planning and divergence control	0.652	.524
Indebtedness indicators	5.557	.005
Sales market analysis	0.940	.395
Risk management	0.021	.979
Continuous competition analysis and industry analysis	3.064	.052
Market share indicators	1.359	.262
Balanced Scorecard indicators and continuous divergence monitoring	2.326	.104
Company's potential analysis	0.027	.973
Product lines analysis	0.673	.513
Analysis of management quality	1.810	.017
Marketing concept analysis	0.974	.382
Research and development analysis	0.998	.373
PESTLE-Analysis	0.445	.642
Z-factor	0.201	.819
<b>Operative, short-term elements of EWS</b>		
Continuous monitoring of accomplished/divergence from planned profits	4.895	.010
Operative planning and divergence control	0.651	.524
Liquidity indicators	0.697	.501
Financial and development analysis	7.391	.001
Business indicators from financial reports	2.852	.063
Continuous planning and divergence monitoring on a three-months base	2.068	.134
Continuous planning and divergence monitoring on an annual base	1.128	.330
Monthly meetings with company departments	1.633	.201
Continuous planning and divergence monitoring on a monthly base	1.874	.160
Economic indicators	0.067	.935
Profitability indicators	0.214	.808
Continuous planning and divergence monitoring on a two-weeks base	13.269	.000

**Table B:** ANOVA test for: Country and relevant indicators in planning, control and reporting

	<b>F</b>	<b>p</b>
Financial indicators	9.584	.000
Market & customer indicators	16.636	.000
Business process indicators	4.437	.014
Employee indicators	31.544	.000
Innovation indicators	7.709	.001