Barriers against effective responses to early warning signs in projects

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Abstract

It is a major challenge for project organizations to react sufficiently quickly to the identified early warning signs of project problems in order to avoid the occurrence of those problems. This article investigates project and project organization specifications that influence the effectiveness of responses to early warning signs in projects. Based on a survey of Norwegian project managers or leaders' approaches to responding to such signs, this study reveals that there are specific barriers to their ability to respond to identified early warning signs. Barriers may develop due to organizational factors, such as project managers' optimism bias, the normalization of deviance within an organization, and the lack of an outside view. They can also develop due to projects' complexity. The authors elaborate on Ansoff's management model by clarifying the mentality filter in order to better define the procedure whereby obstructions are created. © 2015 Elsevier Ltd. APM and IPMA. All rights reserved.

Keywords: Early warning signs; Organizational factors; Response; Filter; Barriers

1. Introduction

The concept of ‘early warning’ is not new. The idea was first discussed by Ansoff (1975), who argued that even unexpected discontinuities are indicated by some warning signs. However, the concept of early warning is generally underrepresented in project management literature. Nevertheless, according to Nikander (2002), the project management literature includes some statements that may be interpreted as including examples of early warnings.

Some of the approaches that have been mentioned in the literature as early warning sources include risk analyses, stakeholder analyses, performance measurements, and project health checks. The sources imply that the approaches can aid project managers or organizations in taking timely actions in response to indicators of poor performance and thus increase the likelihood of project success (Kappelman et al., 2007; Kerzner, 1994; Vanhoucke, 2012). Although the above-mentioned methods are applied in many cases, project failures still occur. According to Williams et al. (2012), ‘weare notvery good atpicking early warning signs.’They highlight problems related to three main areas: understanding project risk and uncertainty, understanding project complexity, and the detection of people's tacit knowledge and comprehending their ways of responding and interacting. Williams et al. also state that established assessments fail to recognize early warning signs, partly due to technical issues, but mainly due to the minds of the individuals concerned. Despite the challenges, studies have shown that although assessments are not completely successful in identifying all early warning signs, the exercises themselves raise awareness and provide opportunities for critical questions to be raised and discussed. If the exercises are performed early enough, when real options are still available, the assessments may prove to be a powerful tool. Further, Williams et al. (2012) state that although formal methods are useful for identifying early warning signs in the aspects they are designed to consider, informal ‘gut feeling’ approaches are a possible means for identifying signs without having a specific focus or issue in mind. When applying early warning identification approaches, both formal assessments and informal ‘gut feeling’ approaches lead to essential information that, according to Nikander's (2002) model, needs to be processed in order to evaluate the level of seriousness of the identified signs. After processing the information, it is necessary to respond to prevent real problems from occurring. Although there is evidence that it is possible to detect early warning signs in projects and despite the existence of the necessary information, in many cases the appropriate response is missing from project managers. This may be due to many reasons, such as time pressure, a tendency for optimism, and the effects of politics (Williams et al., 2012), over-optimism, lack of tolerance of warnings, and lack of an outside view (Lovallo and Kahneman, 2003), or the ‘normalization of deviance’ (Pinto, 2013). Through our research we sought to understand better the issues associated with barriers to project managers responding effectively to early warning signs as a means to prevent failure. We investigated both process-related aspects and psychological aspects that need to be enhanced to strengthen the project managers' responses. We started with a literature review of aspects of early warning, including the phenomenon of early warnings in projects, the early warning procedure, and organizational aspects that can be interpreted as possible obstacles to effective responses to early warning signs of problems. This led to our understanding of the project managers' approaches undertaken on the basis of the information they obtained on the status of their respective projects throughout the project's life cycle, and we examined the conditions under which early warning signs were neglected, with undesirable consequences. Thereafter, we conducted a survey among experienced project managers and leaders from various industries in Norway in order to examine in detail the main factors affecting the process of project managers reacting to the identified early warning signs in projects. Our study focused on addressing the following research questions:

Q1. What are the main barriers to project managers responding to identified early warning signs?

Q2. What are the organizational and project-specific issues that influence the effectiveness of the responses to identified early warning signs?

Q3. What approaches enable project managers to enhance the process of responding to identified early warning signs?

From our literature review and the findings from the empirical study, we discuss in this article both a set of conditions under which early warning signs are less likely to be acted upon and the possible approaches that may enhance the process of taking actions under those specific conditions. Thereafter, we present out conclusions and brief suggestions for future research.

1. . Literature review

2.1 . The early warning phenomenon

The generic idea ofearly warning is a wide concept. It applies to almost any activity, sector, or area where it has value for obtaining indications as early as possible of some development that in the future will become clearer, typically indications of a negative nature. The debate on early warning in a management context was initiated by Ansoff (1975). His core idea was that even unexpected discontinuities are heralded by some warning signs. The suggestion is supported by Nikander (2002), who deals extensively with literature on the concept of early warning signs in his doctoral dissertation: ‘an early warning is an observation, a sign, a message or some other item that is or can be seen as an expression, an indication, a proof, or a sign of the existence of some future or incipient positive or negative issue. It is a sign, omen, or indication of future developments’.

Nikander (2002) points to findings by Ansoff and McDonnell (1990) on possible filters that a message or piece of information from a firm's environment should pass through before arriving at that firm. Such filters can either restrict or ease the processing of information. Nikander (2002) cites Ansoff's three main filters: the surveillance filter, the mentality filter, and the political/power filter (Fig. 1). The first stage in processing information, exemplified by the surveillance filter, requires a company, project, or organization to choose what kind of information is needed and what type of techniques should be employed to procure it. The mentality filter is sociological and psychological in character, and at this point a receiver evaluates the received information and decides what to accept and what to eliminate as unnecessary, unrealistic, or irrelevant. The third and final filter in the process, the political/ power filter, is used especially by decision makers and determines what type of information is permitted to influence the decisionmaking process.

According to Nikander (2002), with whom our previous findings are consistent, very little literature to date deals explicitly with early warning in projects and project management. However, project management literature includes some statements that directly or indirectly refer to the concept of early warning and approaches to its identification. Table 1 presents a brief description of other literature sources which can be interpreted as early warning sources.



Fig. 1. Management information (Ansoff, 1984, cited in Nikander, 2002).

Although there are different ways for structuring the early warning system in different types of projects (Klakegg et al., 2010), the function of the governance framework that looks for early warning signs in projects is common among all types of projects within different industries. This can be explained by the following considerations stated by Nikander (2002): 1) the early warning phenomenon has a risk related character, 2) the studies of communication is familiar with early warnings and 3) the project management literature contains references to the phenomenon. However the choice of the specific approach and what to measure is very much dependent on the project itself, the project's organization, and the project's context.

The main focus of this article is the three filters and the type of information that passes through them or is blocked by them. We aim to identify how and why these virtual filters exist and how they influence project managers' final action or response given to the acquired information.

2.2 . Obstacles to identifying and acting upon early warning signs

In our earlier research we have examined the available literature to identify possible sources of early warning signs within projects (Haji-kazemi et al., 2013). Some sources are directly mentioned in the literature and some are indirectly mentioned as possible approaches to identifying early warning signs of future problems. We use the same approach in this article to find possible barriers to project managers' responses to early warning signs within projects. We have found very few references besides Williams et al. (2012) work, which briefly refers to possible reasons for lack of responses to early warning signs within projects, directly mentioning the obstacles to responses to such signs. Although Ansoff's management model discusses the possible filters, it does not explain why these filtersarecreated.Wethereforeconductedastudyofdifferent fields relevant to project management in order to find possible reasons that may contribute to the formation of the filters.

The approach we took was to investigate concepts closely related to the early warning concept. A thorough literature study of all the areas which deal with the early warning phenomenon was carried out in order to identify the fields which are most relevant to the project management area. We found that the closest concepts are ‘forecasting’ and ‘prediction’, due to the fact that early warning signs of problems are identified on the basis of predictions and assumptions of future. Within the sources pointing to these concepts, we chose the ones which discussed possible drivers for making irrational or false decisions.

According to Lovallo and Kahneman (2003), high numbers of business failures are not mainly due to rational choices that later become inappropriate, but rather as a result of faulty decision making, which occurs when decisions are based on delusional optimism rather than on rational weighting of gains, losses, and probabilities. In the former case, the benefits are overestimated, the costs underestimated, and potential problems and miscalculations are overlooked.

Wu (2010) claims that business failure prediction methods are generally important and purposeful due to the possibility for corporate managers to apply failure prediction methods to develop early warning systems for possible business failure and thus take proper actions to prevent such failures. Moreover, also sponsors and financial institutions can utilize the methods to enable better decision-making processes.

In order to improve the accuracy of forecasts, Lovallo and Kahneman (2003) suggest the application of two distinct modes of forecasting: the inside view and the outside view. The forecasts prepared by an internal project team focus closely on the case objective and the obstacles to its completion, and are characteristically extremely optimistic. By contrast, the outside view completely neglects the project's details and rather examines the experiences of a class of similar projects, draws up a rough distribution of outcomes for this reference class, and then positions the current project within that distribution, and the result is much more accurate than that obtained using the inside view (Flyvbjerg, 2013; Lovallo and Kahneman, 2003). It should be noted that optimism should be promoted to keep employees motivated. The innate optimism of professional project managers allows them to deal effectively with the contradictory characteristics of their work environment (Dolfi and Andrews, 2007), but at the same time the decision makers should generate realistic forecasts (Lovallo and Kahneman, 2003).

Another view is that the optimism bias is one of several results of negative dynamics caused by the normalization of deviance within project organizations (Pinto, 2013). The concept of the normalization of deviance was initially published by sociologist Diana Vaughan (1996), based on a study of the NASA culture prior to the Space Shuttle Challenger disaster, and suggests that the unexpected becomes expected, which in turn becomes accepted. Social normalization of deviance means that people within an organization become used to a given deviant behavior to the extent that they no longer consider it deviant, although such behaviors far exceed their own elementary safety rules. The concept also represents a cultural attitude that deliberately creates conditions under which mistakes are made, and as a result it provides a perfect environment for corporate or project misbehavior. Problems appear when actions and attitudes such as organizational conflict become culturally embedded and destructive but remain viewed as a normal part of organizational processes without questioning the assumptions driving them. Pinto (2013) categorizes three main types of such behaviors: (1) project proposals and strategic misrepresentation, (2) client/contractor relationships and planning, and (3) scheduling dynamics. In order to resolve these issues Pinto (2013) suggests both remediation through project governance and reflection through organizational learning. The challenges related to these actions should not be overlooked. For example, organizational learning often faces challenges due to the unique nature of project-based work, which develops barriers and limits that prevent or slow down the transfer and use of knowledge obtained from earlier projects (Bartsch et al., 2013). A study by Bartsch et al. (2013) shows that project managers' intra-organizational social capital enhances organizational-level learning and can contribute to lowering the likelihood of undesired outcomes.

Anderson and Galinsky (2006) have a rather distinctive opinion on the source of optimism, stating that a sense of power increases the level of optimism in perceiving risks and thus leads to more risky behavior. They also state that powerful people might be highly focused on the payoffs, lose sight of the possible consequences of their actions, and become increasingly optimistic that they can get away with a range of actions to the extent that their behavior becomes more risky and they are more likely to violate social and ethical norms.

Table 1

Early warning identification sources reported in published sources.

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| --- | --- | --- |
|  | Source | Description |
| Early warning sources directly discussed in the literature | Risk analysis (Nikander, 2002; Niwa, 1989) | Since early warning refers to a problem that may arise in the future, the relation between the early warning phenomenon and risk management is rather obvious (Nikander, 2002).Early warning signs provide an indication of evident risks and thereby an assessment of a project's exposure to future problems and failure (Kappelman et al., 2007).The concept of risk alarms are meant to be advance warnings of emerging problems (Niwa, 1989). |
|  | Project assessment methods (Cooper, 2005; Cooper et al., 1997;Jaafari, 2007; Klakegg et al., 2010; Miller and Lessard, 2000;Wateridge, 2002) | Project assessments, which go by many names, some of which are project reviews, project health checks, benchmarking, post project evaluation and project audits (Klakegg et al., 2010), have been discussed as a way to identify areas that should be addressed by early warning monitoring.There is abundance of literature on the stage gate approach and how it aims to preempt potential problems that make a project non-viable (Cooper et al., 1997; Cooper, 2005). |
|  | Earned value management (Kim et al., 2003; Vanhoucke, 2012) | An approach that provides triggers or early warning signals (Fleming & Koppelman, 2000).Earned value management is perceived as being a good forecasting or an early warning tool that enables project managers to plan and control projects proactively (Kim et al., 2003). |
| Potential early warning sources indirectly discussed in the literature | Stakeholder analysis (Cleland, 1986; Savage et al., 1991) | There are a number of models proposed that outline the process of undertaking a stakeholder analysis, (for example, Savage et al., 1991; Cleland, 1986; Karlsen, 2002) but they have clear similarities, which include activities to identify the project's existing and presumed future stakeholders; gain a better understanding of their needs and expectations toward the project and its outcomes; and anticipate their strategies and actions. The outcome of a stakeholder analysis will be some level of insight into what stakeholders the project has to relate to and what they expectfromtheprojectandhowtheymightreactiftheydon'tachievethis. The issues emerging from such an analysis can clearly be utilized to identify early warning signs. |
|  | Cause/effect analysis (Klakegg et al., 2010; Leszak et al., 2000; Ohatka and Fukazawa, 2009; Parker and Skitmore,2005; Sambasivan and Soon, 2007) | Since this topic focuses on causes and origins of issues, it is closely related to the success and failure factors in projects. Nikander (2002) provides a model indicating that problems, their causes and early warnings are connected through a chain. There are other sources which, although not mentioning the term “early warning” directly, refer to cause and effect analysis and root-cause analysis approaches for the identification of risks inadvanceinordertopreventfutureproblems(Leszaketal.,2000;Ohatka and Fukazawa, 2009; Parker and Skitmore, 2005; Sambasivan and Soon, 2007; Williams et al., 2012). |
|  | Maturityassessment (Ahern et al., 2004;AndersenandJessen,2003; Cooke-Davies and Arzymanow, 2003; Kerzner, 2001) | The key idea is that it might be possible to assess how mature (i.e., how qualified) an organization is to run projects, and thus very early, even before the project starts, determine whether it seems likely that the project will run smoothly or end up in trouble. Andersen and Jessen (2003) refer to this term as having reached a state of full natural or maximum development.Thisdefinitionfitsproductandorganizationsalike,although it might be argued that organizations never reach a state of full maturity. Maturity models have also been extensively used as an improvement tool, where organizations conduct self-assessments (Ahern et al., 2004). If such maturity assessments reveal areas of lower maturity, it is natural to consider these targets for early warning monitoring. |
|  | Interfacemanagement(Calgarand Connolly, 2007;Voss,2012) | This process is described by Cleland and Morris (1988) as an element that serves as a natural checkpoint for managers in order to monitor performance and thus prevent problems from falling into a snowball process.The main objective of this process is to facilitate agreements with other stakeholders regarding roles and responsibilities, timing for providing interface information, and identification of critical interfaces early in the project through a structured process. The overall goal for the process is early identification of issues that have the potential to impact cost or schedule. This is done in order to minimize or to remove this impact, and alsotopromoteclear,accurate,timely,andconsistentcommunicationwith other organizations for exchanging interface information |

(continued on next page)

Table 1 (continued)

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| Source | Description |
| Extrapolation from earlier projects (Kappelman et al., 2007; Kerzner, 1987; Klakegg et al., 2010; Miller and Lessard,2000; Pinto and Slevin, 1988) | This approach is a way of using previous experience gained, but the validityforthecurrentsituationmustofcoursealwaysbeensuredfirst.The project management literature has numerous references to how experience from earlier projects is used in order to identify early warning signs. See, for example, Pinto and Slevin (1988), Kerzner (1987), Pinto and Prescott (1988) and the IMEC study (Miller and Lessard, 2000). A somewhat different approach has been used by Kappelman et al. (2007) and Klakegg et al. (2010), in which experience from earlier projects is used as abasis for discussions with projectmanagement experts, inorder to get their qualified assessments of the relative importance of the early warning signs. |
| Gut feelings (Klakegg et al., 2010; Nikander and Eloranta, 2001; Whitty, 2010)Project health checks (Construction Industry Institute, 2006;Jaafari, 2007; Wateridge, 2002) | These signs are described by Nikander and Eloranta (2001) through the statement: “anticipatory feelings are the least easy to detect, identify and interpret, intuitive feeling” (p. 387). Klakegg et al. (2010) make a very simple categorization of early warning signs, where they are either identified through assessments or they are based on “gut feeling”. Such a “gut feeling” will usually be closely related to the tacit knowledge of the recipientofthesignals.Whitty(2010)showedtheimportanceof emotions as an expression of knowledge, and also the use of body language as such an expression, and exemplified the importance of reading body language in a project setting in order to read some of the—sometimes even critical—signs about the state/condition of a project. |
| Brainstorming (Osborn, 1953; Stroebe et al., 1992) | Thebrainstorming techniquehasits rootsinworkinadvertising as earlyas 1939 (Osborn, 1953). Stroebe et al. (1992) identified three processes that detailed brainstorming efforts; free riding, evaluation apprehension, and blocking. Issues arising from the brainstorming effort can then feed a process to identify early warning signs. |

Another aspect which we believe is likely to act as a barrier against effective actions toward early warning signs of potential problems is the complexity involved with projects. There is an abundance of literature on the concept of project complexity (Baccarini, 1996; Bosch-Rekveldt et al., 2010; Cooke-Davis et al., 2007; Davies and Mackenzie, 2014; Giezen, 2012; Jaafari, 2003; Williams, 2002) According to Klakegg et al. (2010), it seems reasonable and quite well documented that increasing level of complexity makes it more burdensome to discover and interpret signals. In these projects early warning signs are sometimes unknown unknowns and due to this fact may not appear relevant until too late. Klakegg et al. (2010) in their study recommend several approaches which can aid project managers to overcome this barrier.

Table 2 summarizes the possible barriers to project managers' responses to early warning signs and suggested solutions as reported in various publications.

3 . Methodology

The methodology used in our study followed an inductive reasoning approach based on a survey. In common with other types of field study, this type of research can contribute to the advancement of scientific knowledge in different ways (Forza, 2009). According to Pinsonneault and Kraemer (1993), survey research is a quantitative method that requires standardized information about the topics being studied and the subjects studied might be individuals, groups, organizations, they might also be projects, applications, or systems. Correspondingly, researchers often differentiate between exploratory, explanatory, and descriptive survey research (Filippini, 1997; Malhotra and Grover, 1998 cited in Forza, 2009; Pinsonneault and Kraemer, 1993). The survey research design adopted in this study was a combination of exploratory and explanatory research. An exploratory research design is performed in the early stages of investigation and research on a phenomenon and used when the researcher's aim is to obtain preliminary insight into a subject. While an explanatory survey research design is performed when knowledge of a phenomenon has been articulated in a theoretical form using well-defined concepts, models and propositions (Forza, 2009).

As mentioned in Section 2.1, in general there is deficiency of literature on the phenomenon of early warning in projects and the early warning procedure as a whole. The main research within this area has been done by Nikander (2002) and Klakegg et al. (2010). Further, with the exception of Klakegg et al. (2010), we have found very few sources that directly indicate the main reasons for project managers to overlook the early warning signs of problems within projects. So there is a need for exploratory research in order to investigate on possible barriers against an effective early warning procedure. However, during the research for our study, both literature studies and our semi-structured interviews,we identified certainelements whichcan beinterpreted as possible barriers against identification and thus the lack of response to early warning signs of problems, based on which, a survey was conducted within industrial and academic organizations in Norway during the spring of 2014. Nevertheless, although the survey tends to test the research findings, since the theory is

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| Table 2Possible barriers to project managers' responses to early warning signs and suggested solutions.

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| Reference | Barrier Description | Solution |
| Lovallo and Kahneman (2003) | Over-optimism Benefits are overestimated, costs underestimated, and the potential for problems and miscalculations is overlooked | Adopting a dual view (inside and outside view) |
| Pinto (2013) | Normalization of deviance The unexpected becomes expected, which becomes accepted. | Remediation through project governance and reflection through organizational learning |
| Bartsch et al. (2013) | Fragmentation Projects hinder organizational learning | Intra-organizational social capital |
| Hofstede (1984) | Culture of uncertainty avoidance The extent to whichthe members ofa culture feel threatened by ambiguous or unknown situations. | – |
| Aaltonen and Sivonen (2009) | ‘Avoidance’ and ‘dismissal’ stakeholder response strategies | Choosing a strategy whereby a focal organization loosens its attachments to stakeholder-related claims and tries to guard and shield itself from the claimsChoosing a strategy by which a focal organization ignores demands and pressures posed by stakeholders | Choosing the most effective strategy through the interaction of multiple project network actors |
| Flyvbjerg (2013) | Systematic fallacy (illusion) in decision making | Causes people to underestimate the costs, completion times, and risks of planned actions, whereas they overestimate the benefits of the same actionStems from actors taking an ‘inside view’, focusing on the constituents of the specific planned action rather than on the outcomes of similar actions already completed | Taking an ‘outside view’ on planned actions, which consists of using experience from similar ventures already completed, including (a) the average outcome in sets of such ventures, and (b) distributional information about outcomes |
| Flyvbjerg et al. (2009) | Optimism bias and strategic misrepresentation | Planners and project promoters make decisions based on delusional optimism rather than on a rational weighting of gains, losses, and probabilitiesPolitical–economic explanations and strategic misrepresentation account for the systematic underestimation of costs and overestimation of benefits found in data | Taking an outside view |
| Klakegg et al. (2010) | Time pressureMismatch in incentives between the organization and individualsTendency to optimismEffects of politicsProject complexity | Difficulties for acting due to lack of time to think ahead and question assumptions Individuals take their experience to the next project and fail to recognize the need to secure the ability of an organization to learnTrust in a project team's ability to fix the problems and that all will be fine in the end.Political pressure (exerted by the project owners) to implement a given solutionA situation involved with flux and unpredictability and large amount of unknown unknowns | Secure transparency in decision makingInstall project assuranceImproving project manager key competences and skillsImproving formal assessment approaches Using approaches which encourage more interactions so that patterns can emerge |

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not concrete and well defined, it is hard to state that the survey is completely explanatory, but is rather a combination of exploratory and explanatory research.

The data was collected via a questionnaire designed especially for the study and based on an analysis of literature studies and our semi-structured interviews. The respondents included members of the “Project Norway” association, which is a national arena for the exchange of experiences, building networks and providing an external reference to the member organization's own project expertise. It is a research-based collaboration with Norwegian project-based organizations in the public and private sector. It should be noted that although the results are directly applicable to the Norwegian project context, we see no reason why the results shouldn't be applied to other projects in other countries as well.

The questionnaires were sent to the respondents via email, directing them to a web site to provide their answers. The target population of the survey included a wide representation of project-based organizations without any expressed interest in our study topic. The questionnaire was sent to approximately 350 potential project manager respondents for whom we had valid email addresses. We received completed questionnaires from 86 respondents. This gives a return rate of approximately 24%.

Our survey was designed in three main parts. The required data and the types of questions in each section are presented in Table 3.

The authors were aware that the use of discrete visual analogue scales (DVAS) questions within the survey can influence the results in a subjective manner. They were also aware that this scale is uni-dimensional and only gives 5 options of choice, so the space between each choice cannot possibly be equidistant. However, the tool was chosen to be used first of all due to the fact that the scale is suitable for measurement of attitudes, beliefs and opinions and second of all it is the most universal method for survey collection,

Table 3

The contents of the questionnaire.

Table 4

|  |  |  |
| --- | --- | --- |
| Industry | Percentage of respondents | Number ofrespondents |
| Oil and gas | 20% | 17 |
| Construction | 20% | 17 |
| IT | 20% | 17 |
| Infrastructure and transportation | 10% | 9 |
| Telecommunication | 8% | 7 |
| Consultancy/advisory | 7% | 6 |
| Other | 7% | 6 |
| Research and higher education | 3% | 3 |
| Public sector | 3% | 3 |
| Energy and electricity supply | 2% | 1 |

Distribution of the respondents by industry.

|  |  |
| --- | --- |
| Section Required data | Type ofquestion |
| 1 Q1. Industry which they worked in | MultipleChoice |
| Q2. Year of experience | Open ended |
| Q3. Working title | Open ended |
| 2 Q4. Role in the project | MultipleChoice |
| Q5. Complexity level of the project | DVAS (1–5) |
| Q6. Optimism level within the project organization | DVAS (1–5) |
| Q7. Possibility for all project participants to express their opinion | DVAS (1–5) |
| Q8. Methods systematically used in the project | Multiple choice |
| Q9. Frequency of use of systematic methods | Multiple choice |
| Q10. Level of activeness in analysis of methods | DVAS (1–5) |
| Q11. Most important problems experiences within the project | Open ended |
| Q12. Identified EW signs of those problems | Open ended |
| Q13. EW identification stage | The RatingScale |
| Q14. Difficulty level for discussing EW signs | DVAS (1–5) |
| Q15. Level of effectiveness of discussions on identifiedEW signs | DVAS (1–5) |
| Q16. Importance of different sources for identifyingEW signs | Rank OrderScaling |
| Q17. Action taken against identified EW signs | Open ended |
| Q18. Strength of responses to identified EW signs | DVAS (1–5) |
| Q19. Reasons for not identifying EW signs | Multiple choice |
| Q20. Importance of reasons for not responding to EW signs | Rank OrderScaling |
| 3 Q21. Recommendations for improving the EW identification process | Open ended |
| Q22. Recommendations for improving the EW response procedure | Open ended |

therefore easily understood, easily quantifiable and subjective to computation of some mathematical analysis.

Our analysis covered frequency analysis of responses and the correlation among the characteristics of the projects and project organization with the approaches taken by project managers in order to respond to the identified early warning signs. This focus was chosen because our earlier research had revealed that the main challenge in responding to warning signs does not tend to lie in the early identification process but rather in response and reaction to the signs. In many projects, identified early warning signs are overlooked and consequently problems occur at a later stage. We found a number of explanations for the main obstacles to responses to early warning signs and the conditions that negatively influence the response process.

Following the analysis we evaluated the correlation among the obstacles to responses to early warning signs and other characteristics of the projects and project managers covered in the questionnaire survey. This was done through several internal workshops with participation of the authors in order to thoroughly discuss and interpret the survey results based on both finding from the literature and the authors' own experiences. The aim was to perform a data triangulation which tends to strengthen the research results.

By using exploratory research, we were able to define the existence and strength of the relationships between specific project characteristics and factors related to the projects' early warning procedure. The values of the correlation factors for the projects' characteristics and the factors related to the projects' early warning procedure showed an adequate correlation among several of the

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Number of respondents

Years of experience

Fig. 2. Years of experience of respondents.

variables.

Our literature research on correlation factors revealed different opinions on the categorization of correlation factors according to their strength. For example, Field (2005) states that when estimating the intensity of relationships between two variables, a partial correlation coefficient (r) below ±0.3 shows a small effect, the correlation coefficient between ±0.3 and ±0.5 shows medium effect, and a correlation coefficient above ±0.5 shows a strong effect. However, according to Shortell (2001) there is no rule for determining whether the size of a correlation coefficient is considered strong, moderate, or weak. Further, the interpretation of a coefficient partly depends on the topic of study. For example, in studies related to human's mental life, we rarely see correlations above 0.6. Rather, correlations above 0.4 are generally considered to be relatively strong, correlations between 0.2 and 0.4 are considered moderate, and those below 0.2 are considered weak. When items that are more easily countable are studied, we can expect higher correlations. In our case, since the variables included

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50

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Complexity level

Percentage of respondents

Fig. 3. The projects' complexity level.

human issues, the level of precision in the responses received was not very high, whereas the level of subjectivity was quite high. We therefore expected the correlation factors to be lower, and consequently considered the categorization as a base for the analysis of the correlations.

It is also important to calculate the p-value for each correlation. In general, the smaller the p-value, the more evidence that we have against our null hypothesis. According to Cleophas et al. (2009) a p-value b 0.05 is generally used to indicate a significant difference from the null hypothesis while a p-value N 0.05 is most likely to indicate no difference from the null hypothesis. The results will be analyzed in the following sections. 4 . Survey results

4.1 . Summary of the survey responses

The results of the survey showed that our respondents included mainly project managers or project leaders with an average of 19.5 years of experience who worked in various industries. The respondents generally had a master degree in engineering. Fig. 2 illustrates the years of experience of the respondents and Table 4 presents the percentage of respondents from each industry. This question was a multiple choice question and some of the respondents chose more than one industry.

The majority of the respondents worked in three industries: oil and gas, construction, and IT. The next largest percentage worked in the infrastructure and transportation industry (10%). A total of 56% of the respondents were either project leaders or project managers, followed by project members (18%) and members of steering committees (19%). The remaining respondents included, for example, project coordinators, project planners, and project sponsors. Some respondents selected more than one answer from the possible choices of roles within the project organization listed in our questionnaire.

In order for us to gain an overview of the characteristics of the project organizations to which the respondents were affiliated, the respondents were asked to evaluate the complexity level of the current or most recent project in which they had been involved. The respondents were asked: How do you evaluate the complexity

0

%

4

%

50

%

%

39

%

7

0

%

%

10

%

20

30

%

%

40

50

%

60

%

1

2

3

4

5

Percentage of respondents

Op

Ɵ

mism level

Fig. 4. The project organizations' optimism level.

level of your projects? Answer based on a scale where 1 stands for lowest and 5 stands for highest level of complexity (Fig. 3).

In general, the term complexity in itself is in widespread common usage and each person can be expected to have her or his own understanding of this term (Cooke-Davis et al., 2007). Furthermore project managers understand and use the term complexity in a very broad and diversified way due to the lack of clear distinctions between complex and complicated (Azim et al., 2010). Therefore we cannot claim that what has been measured through survey is the “actual complexity”, but rather an evaluation of subjective experiences of the respondents and how they perceive the level of project complexity. Since complexity influences the capability to manage the project, to obtain success, it is more important to understand how the project manager or project organization perceives complexity or finds the project complicated. The intention for this type of evaluation has been to investigate on how the perception of complexity can possibly influence the early warning procedure and to examine the extent to which data regarding possible early warning signs are extracted and identified as early warning signs in complex projects. In other words, we would like to investigate if the more complex the respondents find the projects, the more challenging will be the performance of an effective early warning procedure.

It should be noted that there are tools which can be utilized for evaluation of the complexity level of projects. An example is the ProjectComplexityandRisk AssessmentTool(PCRA),developed by the Treasury Board of Canada Secretariat in 2013, which is

Table 5

Methods applied systematically within the project organizations.

Method Percentage of Number of

 respondents respondents

|  |  |
| --- | --- |
| Project management methods (cost–time–quality) 80% | 67 |
| Risk/uncertainty management | 73% | 62 |
| Brainstorming | 31% | 26 |
| Performance measurement | 15% | 13 |
| Stakeholder management | 14% | 12 |
| Root-cause analysis | 14% | 12 |
| Maturity assessment | 12% | 10 |
| Other | 11% | 9 |
| Health checks | 8% | 6 |

Table 6

Most important sources for identifying early warning signs and their average rankings by respondents.

Mostimportantsourcesforidentifyingearlywarningsigns Average rank (out of 5)

|  |  |
| --- | --- |
| Gut feelings | 3.4 |
| Project assessment methods | 3.5 |
| Project management methods | 3.8 |

intended to support the Treasury board policy on the management of projects and the standard for project complexity and risk. Using such a tool represents a whole survey of its own which requires excessive time and effort from the respondents. However, we believe this type of tools, besides requiring great amount of time for the respondents, are applicable in situations where the actual complexity of project is under question and not necessarily the perception of complexity.

The same question (i.e. about the complexity level of the respondents'involvementinthecurrentormostrecentproject)was asked about the ‘optimism level’ within the project organization, and the same ranking was used (Fig. 4). Approximately 70% of the respondents ranked the projects as highly complex. In total, 96% of the respondents ranked the optimism level above 3, and 46% ranking it as either 4 or 5, which we interpret as quite high. The same constraints that applied to self-ranking of the projects' complexity level apply to this aspect as well.

In addition, we asked the respondents to evaluate the extent to which the project members could freely express their opinions within the project organization. Using a 5-point scale, 80% of the respondents selected either level 4 or 5, which represented a high level of freedom to express opinions. Only 1% of the respondents selected the lowest level, 1.

The respondents were asked to choose one or more methods from a list of methods used systematically within their project. The results are presented in Table 5. In some cases, the respondents included other methods than the pre-listed options. In addition, a total of 72% of the respondents said that the selected methods had been regularly applied within their project organization, 14% stated that the methods had been used sometimes, and the remaining 24% mentioned that the methods were applied only at particular times.

Afterwards, the respondents were asked to select the phase in which the early warning signs of possible problems were identified. The biggest group of responses related to the planning phase and execution phase, respectively accounting for 37% and 49% of the responses. The remaining responses related to either the concept phase or idea phase of the project.

Table 7

Possible reasons for failure to identify early warning signs in the projects.

|  |  |  |
| --- | --- | --- |
| Possible reason for not identifying early warning signs | Percentage of respondents | Number ofrespondents |
| Lack of effective communication among project members | 25% | 21 |
| Organization's complexity | 25% | 21 |
| Over-optimism | 21% | 18 |
| Unclear strategy | 15% | 13 |
| Conflict among goal and strategy | 12% | 10 |
| Other | 10% | 9 |

Table 8

Reasons for not responding to early warning signs and their average rankings by respondents.

Reasons for not responding to early warning signs Average rank (out of 5)

Over-optimism 3.1

Lack of time to respond 2.9

Lack of effective communication among project members 3.2

Political issues 3.1

Poor management 4.1

Thereafter, the respondents were asked to rank the most important sources for identifying early warning signs on a scale of 1 to 5, where 1 represented the least important source and 5 the most important source. The results are presented in Table 6.

We wanted to know the strength of the responses toward early warning signs in cases where they were identified. Only 35% of the respondents ranked the strength of the responses as either 4 or 5, which represented a rather strong response, while 34% ranked the strength as 3, and the remaining 31% ranked the strength as 1 or 2, which represented a weak response.

The next step in our survey was to investigate the possible reasons for the lack of identification of early warning signs. Both the reasons and the percentage of respondents who had selected each reason are presented in Table 7. The question was a multiple choice question with the possibility to choose more than one option by each respondent.

We then asked the respondents about the most important reasons for not responding to the early warning signs in cases where they were identified. The respondents were given several choices and asked to rank them from 1 to 5, with 1 as the least important reason and 5 as the most important reason. The different options and the average ranking by the respondents are presented in Table 8.

As a final step in our survey, the respondents were asked to recommend approaches that would ease the process of identification and response to early warning signs of possible problems. With regard to the identification process, the respondents' recommendations could be summarized as belonging to four main groups: active risk management, effective communication, frontend management, and project manager competence. By contrast, the respondents' recommendations for facilitating the response process were rather scattered and not easy to categorize. However the responses included the following aspects: systematic risk monitoring and follow-up, effective use of project learnings, effective risk reporting system, effective governance system and proper understanding of project goals and deliverables.

4.2 . The relationship between the attributes of the projects and project organizations and the factors related to the early warning procedures

After compiling an overview of the survey respondents' responses, the next step in our study was to investigate the correlations among different survey results. Table 9 shows the interdependencies we examined in order to find possible correlations among them. Since the correlations could only be calculated for quantifiable variables, the variables that were not ranked by

Table 9

Correlation matrix of variables within the survey.

1077

S.Haji-Kazemietal./InternationalJournalofProjectManagement33(2015)1068

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|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Variables | Project complexity | Optimism level in project organization | Possibility to freely express opinions within the project organization | Difficulty level for discussingEW signs | Effectiveness of discussions on identified EW signs | Stage of EW identification | Frequency of use of systematic EWidentification approaches | Level of activeness in analysis of results of the application of approaches | Importance of different sources for identifyingEW signs | Importance of different reasons for not responding toEW signs | Strength of responses toEW signs |
| Q5. Project complexity | 1.00 | 0.014 | 0.058 | 0.2P-value(0.09) | −0.17 | 0.013 | 0.1 | 0.075 | 0.221P-value (0.04) | 0.32P-value (0.01) | −0.2P-value (0.08) |
| Q6. Optimism level in project organization | 0,014 | 1.00 | 0.04 | −0.07 | 0.04 | −0.2P-value(0.08) | −0.1 | 0.04 | 0.213P-value (0.05) | 0.24P-value (0.04) | 0.21P-value (0.08) |
| Q7.Possibility to freely express opinions within the project organization | 0.058 | 0.04 | 1.00 | 0.05 | 0.3P-value (0.01) | 0.13 | −0.03 | 0.09 | 0.16 | −0.25P-value (0.09) | 0.3P-value (0.004) |
| Q14. Difficulty level for discussing EWsigns | 0.2P-value(0.09) | −0.07 | 0.05 | 1.00 | −0.2P-value (0.06) | 0.01 | −0.03 | 0.09 | 0.386P-value (0) | 0.27P-value (0.07) | −0.3P-value (0.004) |
| Q15. Effectiveness of discussions on identified EW signs | −0.17 | 0.04 | 0.3P-value (0.01) | 0.3P-value(0.01) | 1.00 | 0.02 | 0.11 | 0.075 | 0.228P-value (0.04) | 0.339P-value (0.002) | 0.42P-value(0.0001) |
| Q13. Stage of EW identification | 0.013 | −0.2P-value(0.08) | 0.13 | 0.01 | 0.02 | 1.00 | 0.13 | 0.12 | 0.09 | 0.1 | 0.1 |
| Q9. Frequency of use of systematic EWidentification approaches | 0.1 | −0.1 | −0.03 | −0.03 | 0.11 | 0.13 | 1.00 | 0.18 | 0.17 | 0.14 | −0.17 |
| Q10. Level ofactiveness in analysis of results of the application of approaches | 0.075 | 0.04 | 0.09 | 0.09 | 0.075 | 0.12 | 0.18 | 1.00 | 0.210P-value (0.06) | 0.2311P-value (0.03) | 0 |
| Q16. Importance ofdifferent sources for identifying EW signs | 0.221 P-value(0.04) | 0.213P-value(0.05) | 0.16 | 0.386P-value (0) | 0.228P-value (0.04) | 0.09 | 0.17 | 0.210P-value (0.06) | 1.00 | 0.2812P-value (0.009) | 0.17 |
| Q20. Importance of different reasons for not responding toEW signs | 0.32 P-value(0.01) | 0.24P-value(0.04) | −0.25P-value (0.09) | 0.27P-value(0.07) | 0.339P-value(0.002) | 0.1 | 0.14 | 0.2311P-value (0.03) | 0.2812P-value (0.009) | 1.00 | 0.1 |
| Q18. Strength of responses to EWsigns | −0.2P-value(0.08) | 0.21P-value(0.08) | 0.3P-value (0.004) | −0.3P-value(0.004) | 0.42P-value(0.0001) | 0.1 | −0.17 | 0 | 0.17 | 0.1 | 1.00 |

1 2 3 4 5 6 7 8

Gut feelings; political issues, poor management; gut feelings; poor management; over-optimism, lack of communication among project members; gut feelings; not enough time to respond; project management methods; 9not enough time to respond; 10project management methods, project assessment methods; 11not enough time to respond; 12project assessment methods ~ over-optimism.

numbers were scaled to quantities. For example the question on frequency of use of systematic methods within the project was a multiple choice question including the following choices: regularly, sometimes,onlyonspecialpointsoftimeandother.Theseelements were quantified respectively as 2, 1 and 0. Although the approach does not necessarily allow for accurate results, it provides insight into the level of interdependency of the variables.

The correlation analysis reveals a rather dissatisfactory set of results showing, with only one exception, a moderate correlation among the variables. Knowing that the majority of respondents perceived the complexity level of the projects quite high; the correlation results confirm that it is very difficult to intuitively infer the behavior of the whole complex system from the behavior of the sub-elements (Simon, 1982). This is due to interdependence of a large number of elements within a project (structural complexity) and the high level of uncertainty involved within the system. In addition, these results open up for more detailed research on these elements and their interrelationship within the project context.

1. . Discussion

Our study of the literature on the concept of early warning signs in project management revealed gaps with regard to publications on barriers to responses to early warning signs of possible problems, which in turned motivated us to carry out our survey. Two main ideas emerging from this work are: 1) by clarifying the mentality filter in the model we gain a better explanation to why signals do not produce action, 2) With this better explanation we can consider the suggested practices (outside view etc.), and explain why they improve the situation and cause more signals to produce proper action. In the following sections we discuss our findings and how they led to these two ideas.

5.1. Interpretation of survey results

Having examined the correlation factors of the variables used in the survey, we recognized that there were interrelationships among some of them, which are explained below.

The correlations revealed the significance of project complexity. Such complexity makes discussions more difficult and responses to early warning signs of possible problems weaker and less effective. Our findings relating to project complexity strengthen the findings from research conducted by Klakegg et al. (2010) which concluded that increasing complexity makes it more difficult to detect and interpret signs of potential problems. This is due to the fact that in complex projects, matters are less well-known and more interconnected and interdependent. This finding from the survey can also be due to the fact that in complex projects, there is a mixture of hard and soft issues among the early warning signs, which are related to for example attitudes and values, and these are hard to measure or even detect. But since the p-value in both correlations is higher than 0.05, we cannot strongly indicate that the correlation is credible. This means that it is not necessarily the complexity factor which increases the difficulty level for discussions on early warning signs and the strengthofresponses. Infact we believe the organizational factors are much more influential on the early warning procedure than the project specifications.

Results also show that the project complexity level is moderately correlated to the importance of gut feelings as a source for identifying early warning signs and the importance of poor management and political issues as factors influencing the response to early warning signs. The first finding is consistent with Klakegg et al.'s (2010) work, which indicates that the more complex the project, the more important gut feelings become as a source for identifying early warning signs. In fact the formal project assessment methods, which are usually dominated by analytical approaches, may not be the right approach in really complex projects.

The latter finding can be explained based on Williams' (2002) study, which states that as the complexity and scale of attempted projects increases, the ability to bring these projects to a successful completion dramatically decreases. Also the complexity and dynamics in the environment are hard to foresee and respond well to (Klakegg et al., 2010). It is probable that this fact may be overlooked by project members and thus be blamed fully on poor management. However we do not claim to minimize the importance of the role of project managers in effectively managing the complexity. It is indeed one of the most important roles of project managers to find approaches for dealing with the complexity involved in their projects. For example Williams (2002) suggests decomposing complex projects into simpler sub-projects or programs of sub-projects.

Another influencing factor is the political issues involved in the project. This is perhaps one of the most important issues which affect the early warning procedure, seen in the way Ansoff (1984) in his management model points to political/power issues as one of the main filters against action upon early warning signs. This effect can become stronger in complex projects where there is added complexity through the multiplicity of goals (Williams, 2002). Thomas and Mengel (2008) also point to the importance of attaining skills in organizational politics in order to successfully manage complex projects. Since the P-value for the correlations mentioned above is less than 0.05, we assume that these relationships are credible.

|  |
| --- |
| PoliƟcal/power filterDecision maker mentality filterInformaƟonAcƟonEnvironmentData (received by observer)Data (received by decision maker) PercepƟonSurveillance filter**Observer mentality filter**Fig. 5. Filters to prohibit actions in response to early warning signs, adapted from Ansoff's management model (Ansoff, 1984). |

Our second set of findings is related to the optimism level within the project organization. The survey results showed that the higher the optimism levels within the project organization, the later early warning signs were identified. This finding can be explained by the fact that optimism creates a tendency for individuals to exaggerate their talents and abilities and thus misperceive the causes of certain events (Lovallo and Kahneman, 2003). This explanationapplies alsotoanotherfindingfromthesurvey,namely that the higher the level of optimism, the more difficult it was to discuss early warning signs of possible problems within the organization. In addition, our findings revealed that the higher the optimism level, the more important “gut feelings” become for identifying early warning signs and conversely the use of project management methods as a source for identifying early warning signs. The latter finding can be explained by optimism bias (Flyvbjerg et al., 2009), i.e., people's tendency to be excessively positive when predicting the outcomes of future planned actions. Due to this phenomenon, experienced people tend to hold the belief that they are capable of handling a project without any additional tool other than their own experience and knowledge, which can be referred to as “gut feelings”.

A further finding is that the higher the level of optimism, the more important poor management is as an explanation for failure to responding to early warning signs. This can be related to the organizational pressure which suppresses the pessimistic opinions while rewarding the optimistic ones (Lovallo and Kahneman, 2003). The findings can also be explained by normalization of deviance (Pinto, 2013), which results from optimism bias and causes false management practices and mistakes to become accepted within the organization. Also political issues were one of the main reasons reported by our respondents as a driver for lack of response to early warning signs. According to Chioma (2012), where projects are awarded on political considerations, little or no attention is given to the recommendations of project appraisals.

Furthermore, the more open an organization is to employees expressing their opinions, the more effective discussions on identified early warning signs will be. According to Martin (1992), by listening carefully to one another's ideas and by responding openly and constructively to one another's concerns, more communication opportunities are created. The practice will lead to more effective discussions on early warning signs of possible problems and thus stronger responses to early warning signs. This may also explain another finding from the survey, which revealed that the more difficult it is to discuss early warning signs, the weaker the responses to them will be. By contrast, the more effective the discussions on early warning signs, the stronger the responses to those signs. The difficulty level for discussing EW signs can also influence the extent to which different reasons for identifying EW signs become important. The survey results show that the more difficult it is to discuss early warning signs, the more important becomes “gut feelings” as the EW identification source. This can be explained by the finding from the study by Klakegg et al. (2010), which reveals that the early warning signs which are identified through gut feelings are mainly related to softer sides of the project, e.g. “lack of culture of openness and good communication”, “strained atmosphere”, etc. It is expected that project environments which lack the culture of openness, thus facing higher difficulty level for discussing early warning signs, are more likely to be subject to problems regarding the soft side of the project. Therefore it is anticipated that the early warning signs of these types of issues are likely to be identified through gut feelings rather than formal audits/reviews. A further explanation can be that in project environments where results of analysis and systematic methods are difficultly discussed and probably seldom taken seriously, it is more likely that a strong gut feeling regarding certain problems is the only way to bring up the problem within the project organization.

The same logic applies to another finding from the survey which reveals that the more effective the discussions on identified EW signs within projects, the more important becomes the project management methods as sources for identifying EW signs. This can be due to the fact that since the project organization is open for effective discussions on possible EW signs, the results of systematic methods and reviews can be easily discusses, thus can be reliable source for detecting the signals of future problems. Also it is more likely that in such project environments, the problems are less on the soft side, but rather related to hard issues.

The high level of effectiveness of discussions on EW signs positively correlates to the level of importance of “lack of time to respond” as the main barriers for not responding to EW signs. The authors believe this can be justified by stating that if the project team is efficient and healthy enough to reach a point where the EW signs are detected and effectively discussed within the project organization, the barrier against responding to EW signs is most likely to be “shortage of time” rather than other aspects such as lack of communication or poor management. “Lack of enough time to respond” has also been ranked as the most important barrier against responses to EW signs in cases where the level of activeness of project participants in analyzing the results of project assessment methods is high. This can also be explained by the above arguments regarding high performance of the project team.

The last correlation found among the questioned variables within the survey indicates that the more important is “project assessments” as a source for identifying EW signs, the more important is “over-optimism” as the main reason for not responding to EW signs. It can be interpreted that by use of project assessment methods, the trends and numbers are in place and the reason for objecting to them and neglecting the results can be the over-optimism of the decision makers who believe that they are less at risk of experiencing a negative event, despite the available information regarding possible future problems.

The p-values in all the correlations mentioned above were less than 0.05, proving the credibility of the interrelationships.

5.2. Why identification of early warning signs doesn't always result in effective responses?

The findings from the survey led us to elaborating on the filters defined by Ansoff (1984) as an explanation for possible obstacles against effective responses to early warning signs. In Ansoff's model, presented in Fig. 2, the receiver evaluates the information from the environment and makes a decision as to what to accept and what to eliminate. In our suggested model, presented in Fig. 5, the observer and the decision maker are treated as separate units. This is where another filter is added to the procedure, which we named “observer mentality filter”. The idea behind this emerged in two stages. The first stage was when we were looking into areas where the decision maker responsible for taking actions is not necessarily the person who observes the warning signs. One such area is risk and safety, and a clear example is the Space Shuttle Columbia disaster, when NASA engineers had spotted something unexpectedly wrong but higher-ranking NASA staff failed to act upon the engineers'informationin time(Rose,2003).Although,inthiscase, the information did pass the observer mentality filter, it is probable that in other cases, observers could hold back information from the decision makers. Such cases could be due to organizations' over-optimism, which according to Lovallo and Kahneman (2003) results in suppressing opinions that are perceived as pessimistic.

The second stage was during the examination of the survey findings, adding further possible explanations why signals don't result in suitable actions. One possible explanation is that in an organization that does not encourage employees expressing their opinions, perceived early warning signs might not be discussed and thus not acted upon. Another finding is that lack of effective communication among project members could also result in lack of effective response to early warning signs.

It is probable that in certain situations, specific warning signs of possible problems will be observed by project members who have no authority regarding decision making. The amount of data transferred to the decision makers depends on the culture of openness and level of effective communication within an organization. We consider that the strength of this filter and the organizational culture of openness are interdependent.

Our survey investigated the extent to which project members felt free to express their opinions within the project organization. The question targeted the openness of the channel through which the project members could freely talk to higher-ranking project members. We consider that in order to ensure the realization of an appropriate action toward an early warning sign, it is crucial to enhance the flow of information through all the filters shown in Fig. 5: In order for information to pass the surveillance filter, it is necessary to enhance the methods that allow enough data to be gathered from the environment to monitor all essential areas that may contain potential problems. Suitable utilization of the methods listed in Table 1 may contribute to the aforementioned practice.

In order for information gathered from a project environment to pass through the observer mentality filter, it is crucial to enhance communication between the observer and the decision maker. As in the case of NASA's Challenger project (Rose, 2003), there may be cases where the decision makers ignore the information transferred to them by the observers of the early warning sign of a problem. It is also probable that observers will tend not to transfer such information to decision makers, and this may be due to flaws in the communication system within a project organization. In such cases, optimism bias or any other type of bias can act as an obstacle to the proper flow of information. According to Flyvbjerg (2013), the outside view tends to reduce the level of optimism bias, but it can also help to mitigate any type of bias, including strategic bias. The outside view prevents such biases by cutting directly to empirical outcomes and building conclusions about future events on those outcomes. Another reason for biases can be the normalization of deviance within an organization, where unaccepted issues become accepted through time, thus resulting in undesired events. Pinto (2013) suggests that remediation through project governance and reflection through organizational learning may be solutions for overcoming this type of problem. It is worth mentioning that informal communication among project members can also be a driver for better flow of information between observers and decision makers, and is referred to in the literature as intra-organizational social capital (Bartsch et al., 2013).

After the information has passed the surveillance filter, it is the decision maker's mentality filter that should be passed. At this point, the receiver will evaluate the received information and make a decision as what to accept and what to eliminate as unnecessary, unrealistic, or irrelevant. At this point too, it is very important that the decision maker or makers take realistic decisions by avoiding underestimations of the risks of actions and overestimations of the benefits. Taking an outside view has been suggested as a solution to the risk of optimism bias, strategic misinterpretation, and illusions in decision making (Flyvbjerg, 2013; Lovallo and Kahneman, 2003; Pinto, 2013), which are some of the many reasons why wrong decisions are made rather than decisions based on a rational weighting of the benefits, losses, and probabilities of undesired consequences.

The strength of the political/power filter, which determines the type of information permitted to influence a decision-making process, is very much influenced by the political pressure exerted by different project stakeholders. It is thus crucial for decision makers to understand the importance and dynamics of power and politics, and to analyze both the political behavior of project stakeholders and the political context within the project organization. This would allow the development of appropriate strategies for managing politics at the project level and at the upper management level. According to Pinto (2000), power and politics are a necessary part of project management and it is crucial for project managers to learn to use them to their advantage by increasing the likelihood of successfully managed projects. Choosing the most effective stakeholder response strategy through the interactions of multiple project network actors can enable decision makers to better deal with political pressures that may lead to the lack of appropriate responses to early warning signs of potential problems in projects (Aaltonen and Sivonen, 2009).

Finally the element of “short time available” has been mentioned as an important factor which can negatively influence the response to early warning signs. It is thus important for managers to take this element into consideration from the very early stages of the project and throughout the whole project.

1. . Conclusion

In this article we have provided empirical evidence to show that there are barriers to project managers identifying and acting upon early warning signs in projects. The key findings of our study show that organizational factors such as complexity, level of optimism, culture of openness, and the degree of effective communication within project organizations strongly influence the early warning procedure as a whole. Based on our empirical study and findings from our literature search, we elaborated on Ansoff's management model by clarifying the mentality filter in order to better define the procedure whereby obstructions are created. It applies especially to large and complex projects where there are various interdependent units working under the umbrella of one project organization.

In the course of this article, we have endeavored to answer the research questions presented in the Introduction. In the following, we present our conclusions regarding each question in turn.

* 1. . What are the main barriers to responding to identified early warning signs? (Q1)

Through the literature study we obtained information on possible aspects that can be interpreted as sources of lack of responses to early warning signs in projects. Examples of the sources include over-optimism, the normalization of deviance, and illusions in decision making. Some of the acquired information was then used in a survey as an input for the respondents. The results of the survey revealed that elements such as over-optimism, poor management, and political issues can greatly contribute to the lack of effective responses to early warning signs of possible problems.

* 1. . What is the role of organizational factors in effectiveness of the responses? (Q2)

Both the findings from the literature and the survey results revealed that organizational factors such as complexity, level of optimism within the project organization, and the level of openness for discussing identified early warning signs within the organization have been indicated as factors that can influence the early warning response procedure. An additional filter to Ansoff's management model was introduced in order to clarify possible obstacles to the effective flow of information and thus enable responsible parties to take appropriate actions in response to identified early warning signs.

* 1. What approaches allows project managers to enhance theprocedure of responding to identified early warning signs? (Q3)

Various literature sources that discuss possible elements that can be interpreted as barriers to responses to early warning signs also suggest solutions for enhancing the flow of information within the project organization, thus resulting in more effective actions being taken. The approaches include taking an outside view, choosing the most effective stakeholder response strategy, and creating social capital.

Thesefindingsarequitelogicalandwhatwouldbeexpected.So the value of this research is that the authors empirically confirm findings which could have intuitively been expected. In addition, the elaboration on Ansoff's management model provides a new perspective to the early warning procedure by taking the observer's role as an important element into consideration.

Further studies that investigate more thoroughly the conditions under which each of the filters are created and the approaches that can ease the information flow through those filters are likely to be of great interest in the near future.

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