TOWARDS A DIGITAL TOOL FOR MANAGING GOALS AND KEEPING TRACK OF GOAL ACHIEVEMENTS IN CHANGE PRACTICE

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Abstract. This paper aims at providing insights into the complex world of managing goals as part of change. The paper describes a digital prototype tool to support goal oriented improvement efforts towards company survival and growth. The prototype was developed based on the needs of practitioners in a SME construction company. Initial results indicates that a tool like the prototype can be helpful. This stimulates further research and development, and might inspire others to make and take advantage of IT solutions that go beyond traditional project scheduling to support change.

Keywords. Goal modeling, change management, digital tool support

1 INTRODUCTION

In the work leading up to this paper practitioners expressed the problem that many small- and medium sized (SME) construction companies are good at "carpentry", but not at management. Practitioners have also stated that management often makes decisions based on intuition in a context characterized by incomplete and inadequate information. These statements concur with previous findings in the literature, i.e. Taylan, Bafail, Abdulaal, & Kabli (2014) who evaluated construction projects and their overall risks in uncertain situations. Lack of management skills can become devastating in situations where a company must handle portfolios of different construction projects and supporting activities with complex dependencies supplemented by necessary company change efforts on a continuous basis.

Garvin (2012) states that for managers today work is all too often fragmented and compartmentalized, finding it difficult to get things done and stay focused. Examples of processes include product development, order fulfillment, customer service, resource allocation and decision making (Garvin, 2012). Not surprisingly, a common practice in various types of organizations is the systematic use of process models for different purposes (Mendling, Reijers, & van der Aalst, 2010), for example to understand AS-IS practices and planning for TO-BE situations (Becker & Kahn, 2003).

Process models are sub-views within Enterprise Modeling (EM) (Vernadat, 2002). EM is about creating a number of integrated models which capture and represent different focal areas of an enterprise, for example business processes, business rules, concepts, information, data, vision, goals and actors (Sandkuhl, Stirna, Persson, & Wißotzki, 2014). However, compared to the use of process models, the systematic use of goal models in practice is less common. Nevertheless, that does not change the fact that navigating by goals has been important to businesses for a long time. As an example of this, Peter Drucker published the book *The Practice of Management* to define key result areas, to outline how to set objectives, and to describe how to use them to direct and steer a business and to measure its performance while looking at management as a whole (Drucker, 2007). In literature, a number of goal modeling techniques have also been described (Amyot et al., 2010; Dardenne, Van Lamsweerde, & Fickas, 1993;

Gross & Yu, 2001; Rolland, 2007; Sandkuhl et al., 2014). An example of using EM for managing goal achievements can be found in Niehaves et al (2006). Unfortunately, goal modeling techniques are often perceived to be complex to understand and require huge amounts of time to create and implement. As such they can be seen as cumbersome to use when supporting business analysts in a rapidly changing business environment (Ullah & Lai, 2011).

According to Ewenstein, Smith, and Sologar (2015) digital tools provide great opportunities for supporting change processes by enabling continuous feedback on change activities, personalization of the change experience, the ability to choose between alternative priorities, improved mission communication etc. Despite such possibilities, most tools on the market instead focus on quality demands and classical project scheduling aspects (Ewenstein et al., 2015). In an attempt to make goals more practical to work with and to ensure a more holistic goal focused management approach towards SME change processes, we have investigated the possibility of developing a digital tool to stimulate and support systematic goal oriented change and improvement practices. In what follows we describe the motivation and design of tool prototype, as well as some experiences of using it.

The paper is structured as follows: Section 2 provides background and motivation for developing the prototype. In section 3 the research approach is presented. In section 4, information on the tool design is presented, before we discuss and conclude our findings in section 5.

2   BACKGROUND AND MOTIVATION

For years, construction companies have had a poor reputation for coping with the adverse effects of change (Smith, Merna, & Jobling, 2013). Even more serious is the fact that many SMEs go bankrupt in an industry that has a great influence on nations' gross domestic product (Love & Irani, 2004). Due to this, a great deal of attention from both business executives and national authorities has been put into finding a way to support these companies to become profitable and sustainable businesses over time.

Olawale and Sun (2010) performed a survey of 250 construction project organizations in the UK. The survey was followed by interviews with experienced practitioners from fifteen of these organizations. They found that the top five factors inhibiting effective project cost and time control are all project internal elements. They also found that construction projects and more extensive construction decisions are often made based on instinctive feeling instead of relying on existing data. These findings contradict previous studies citing external aspects as the most important factors, such as unforeseen ground conditions, climate, etc. (Olawale & Sun, 2010).

Aarseth (2014) presents findings from interviews conducted with hundreds of project managers and project team members suggesting that focusing on task perspective, schedule and scope, is not sufficient in larger complex projects. Equally important it is to focus on business relationships, cooperation between people and companies in the project and the external environment, organizations and context (Aarseth, 2014). This implies the need to have an overall holistic management and decision-making approach in construction companies.

In a Norwegian SME construction company (hereafter called case company) EM was used in a change process together with business management methods in an effort to change and improve core processes within the company. The case company was at the time at severe risk to go bankrupt despite having multiple building projects. This yielded some very encouraging results as regards the profit margin compared to industry in general (Karlsen & Opdahl, 2012). After a period where most of the energy had been used to handle urgent issues, the need for defining relevant goals related to various business areas became a central theme to ensure survival and growth.

Motivated by the writings of Miller et al (2001) and the work by Sandkuhl et al (2014), relevant goals for long-term sustainability were formulated with initial inputs from academics as well as from management consultants with experience from the SME construction sector. A generic goal model was

developed, which included important goals to achieve in order for an SME construction company to thrive. It was inspired by three approaches, Lean (Liker & Morgan, 2006), Balanced Scorecard (Schneiderman, 2013) and the Business Model Canvas (Osterwalder, 2004). The goals were documented in the form of a simple hierarchical goal model. The top-level goals represented important areas to focus on: business processes, HR and personnel management, marketing and sales, accounting and financial management, strategic governance, health, environment and safety as well as organizational learning. The generic goal model was intended to serve as a reference model to be adapted to specific companies.

Based on the generic goal model, further work led to the development of a goal model specific to the case company, constituting a subset of the generic goal model, containing the goals related to the areas of primary concern to the case company and the specific criteria for goal achievements. Each goal was decomposed into a number of sub-goals. Each goal in the company specific goal model was then evaluated by using colors, red (indicator of serious condition), yellow (indicator of weak condition) and green (indicator of satisfactory or good condition). The idea was to progress from red status of a goal to green status.

However, just having a goal hierarchy was evidently not enough, since management is about acting (Drucker, 2007). To ensure that goals were followed by actions, a paper-based scheme was developed where each company specific goal was listed, categorized by color code depending on perceived status of goal achievement, linked to a start and end-date for dedicated focus in the near future as well as motivated by strategy and other formal company decisions. After having used the paper-based scheme in the field for some time, it became evident to the manager that it was useful to perform follow-ups of various business areas. However, it proved difficult and cumbersome to keep the paper-based scheme up to date, due to status changes, schedule changes etc. Evidently, there are huge dynamics related to goal achievements in businesses and the paper-based version had its limitations when it came to keeping track of the current status of goals and capturing the dynamics of changing goals. Therefore, a solution was needed that would enable practitioners to handle both the complexity of following up on current goals and to cope with goals being changed over time. The prototype digital tool presented in section 4 provided a first attempt towards a solution aiming at helping to keep track of the experienced dynamics.

3. RESEARCH APPROACH

We investigated the change practice and managing of day-to-day activities in the case company through a longitudinal, qualitative study. The company mainly constructs single family dwellings. The company constituted of a CEO, a handful of employees handling various administration tasks and construction workers responsible for building the houses. The research can be divided into two phases.

The first phase of the study took place during the years 2002-2012. During those years, the company moved from a state where focus had been on avoiding bankruptcy by choosing selected processes for improvement, to become what could be seen as a more "adult" organization, lending a term from Adizes (2004). As such they focused on achieving more systematic approaches to increase the ability to balance (1) day-to-day activities, (2) handling urgent issues and (3) planning for and implementing change.

In the second phase, which took place during the years 2012-2015, the company functioned as a case company in a EUROSTAR research project where a change management method was developed called The SmallBuild+ change method. This is a practical method to support change processes towards long-term sustainability and survival of SME construcation companies. The SmallBuild+ method as a whole is presented in Karlsen, Persson, and Gudfinnsson (2016). During this project, the researchers collaborated with the employees of the case company following the characteristics of action research as presented in (Oates, 2012). Both researchers and involved practitioners collaboratively focused on practical problems and analyzed the current situation before focusing on how the situation could be changed. This paper focuses on the second phase.

As seen from Table 1, the research in phase 2 was done by collecting data via in-person interviews and written material along with following the action research principles in order to achieve an understanding of complex systems, from the position of observer and team member respectively (Björk, 2003). The main data gathering was done in formal workshops where the researchers, consultants and employees of the construction company collaborated in improvement practices. This entailed, e.g., analyzing the process models of the current situation (AS-IS models) where practitioners gave feedback on the correctness and completeness of the models and evaluating the models describing how the processes should look like in the future (TO-BE). In addition, through onsite observations, listening to employee conversations and taking field notes the researchers gained increased insight into the practitioners' way of working towards business improvement. This material could then be used by the researchers during workshops for example to further develop ideas about business process improvements. At occasions we as researchers were asked to contribute by providing information on modeling concepts and key process indicators, but largely our work has focused on making sense of the practitioners' do´s and don'ts to ensure long-term survival. When developing the SmallBuild+ method it became evident from the managers perspective that having explicit goals to support managing the business was one of the core concepts of the SmallBuild+ method. This paper provides the background on how the need arose from using a paper based goal model to a digital tool that supports managing a business with the use of explicit goals.

Table 1: Sources of evidence in phase 2

Sources of Evidence Phase 2, covering the period 2012-2015
Mail correspondence on modeling Meetings Participation in modeling sessions Participation in company workshops where AS-IS models and TO-BE models were evaluated and verified Model artefacts On-site visits Observations In-person interviews Literature studies Literature references motivating change approach Following and observing personnel on information meetings and courses Business information like financial numbers, tools and technique descriptions

4   THE TOOL

The prototype tool, Figure 1, to support goal oriented improvement practices, mainly revolves around how change can be managed by deploying a goal model. Figure 2 provides an example of a top-level goal model.

More specifically a generic goals model is embedded into the tool and works as a blueprint for prioritizing goals for improvement. Via a selection process, a company specific goal model is then produced, containing relevant goals for the company inherited and adapted from the blueprint model.

It is the user of the digital tool who decides which goals are relevant to focus on, based on the business state and company situation. In the goals section of the tool the user can select and set status for the company specific goals, make and revise an action plan, create a status report of the goal achievement

status, create an action report, update the generic goals model, look at and adjust, add and/or remove company specific goals, and monitor goal achievement statuses, figure 3.
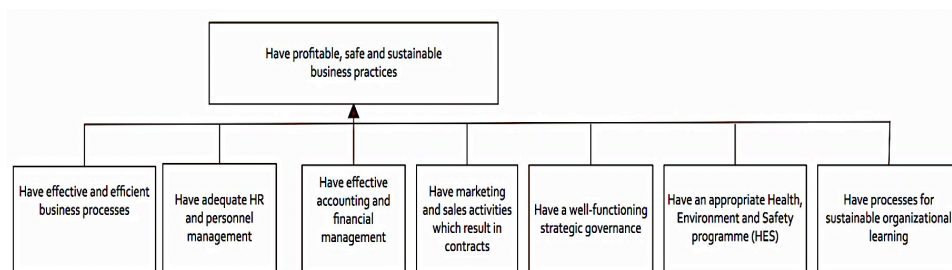

Figure 1: Welcome screen of the first tool version

Figure 1: Example of top-level goal model

Furthermore, the tool provides functions to look at, adjust and remove company specific goals. It is required that every goal is linked to a criterion to indicate its achievement. Goals can also be linked to different business documents, e.g. business plans, SWOT analyses or strategic plans motivating their prioritization.

An action plan for change is made to ensure progress towards company specific goals. More specifically, the action plan is a list of all the goals from the specific goal model, with an option to add an action to each of the goals. Actions are motivated in relation to different business decisions and insights, e.g. relevant business plans, SWOT analyses and business strategy documents. It is possible to specify end and start dates for actions to support follow-ups on goals.

All goals are initially set to either green, yellow or red, where green symbolizes the highest level of goal achievement. Furthermore, since change happens continuously, a goal classified as green can suddenly be in need of a reclassification to a yellow or red status. The user therefore must check the status table at suitable intervals and make necessary adjustments. The status of goals can change for various reasons. The tool also lets the user update the action plan to represent a more realistic timeframe. The user can also monitor the overall goal achievement states to get an overview of the company as a whole.

Figure 3: Keeping track of red, yellow and green goals

A feature that should be emphasized is that the generic goal model can be updated to reflect the best knowledge available on how to ensure the survival and growth of SME construction companies. Hence, the generic goal model represents the best practice blueprint. Changes to the generic model (e.g. a new regulation from lawmakers) will then automatically be inherited in a new company specific goal model. A previously generated specific goal model can then include the new goals from the updated generic model.

A picture of the change method embedded into the application assists the tool user by providing insight into fundamental steps associated with change. A toolbox module linked to the picture provides easy access to change tools fitting the various stages of the change method.

The toolbox module is subject for improvements in future work. In addition, the following areas of improvement have been identified:

In the current version of the generic goal model, there is no weighting of the goals. During the testing of the tool, it became evident that this needs to be done because realistically not every goal can be equally important. However, this is something that will require some research in order for such a weighting to be reliable. The importance of a goal can also be influenced by many factors, both internal and external. In the case company it for example turned out that the goal of having good financial management was a critical goal while goals involving the construction process itself turned out to be less important. In the current version of the tool, there is no explicit support for evaluating which status a goal should have. It is entirely up to the users' knowledge and experience. This introduces an unnecessary element of risk. Evidently, this should be focus in future versions.

5   DISCUSSION AND CONCLUSION

After having studied the challenges of the case company for many years, it became clear that there is a great need to support SME construction companies to achieve prioritized goals. The tool developed is of course only one type of possible support in this effort. Since the general goal model is not complete in a formal sense, but rather constitutes the current best knowledge about what the company must achieve in order to survive, we hope that it will be made more complete in the future. When it comes to the company's specific goals, it is clear that these will be subject to constant change. This implies that it is absolutely necessary that the users of the tool periodically check that they are on the right path, e.g. that

they prioritize the most relevant goals that need to be achieved. As previously stated, the current version of the tool lacks support to evaluate goal statuses and weighting of goals. These are evidently important improvement challenges in the future.

Since the tool is only a tool, there must be established procedures and practices to ensure concrete implementation envisaged by the goals. As we see it, this may be the biggest challenge in relation to digital tool support, especially in businesses that seem to have a habit of basing important decisions intuition. Regarding this aspect we find the work of Aarseth (2014) particularly interesting as it emphasizes the necessity of having several foci at once in a complex setting.

Publishing a paper about digital tool support is motivated by the limited literature focusing on the use of goal modeling in practice. Creating a tool is obviously only one possible remedy in this respect. Another would be to simplify the goal modeling techniques presented in literature. When it comes to the complexity of goal modeling techniques, it is our experience from modeling sessions in the case company that modeling languages and approaches cannot be too abstract. People in SME construction companies are practitioners with a focus on building houses and with little or no sense of complex terms and approaches, as the manager of the case company explained. This should encourage more work on digital tools, methods and techniques that are adapted to small and medium-sized construction companies.

A systematic evaluation of the tool has so far not been carried out. However, the current version of the digital tool was used by the CEO of the case company and then the CEO was interviewed and asked to evaluate the tool. It was clear from the interview that the digital tool was seen as a huge step forward compared to the paper-based scheme that proved inadequate in situations requiring continuous adjustments of goals. One of the most valuable aspects that were pointed out was the fact that the dynamic nature of goals could be captured and goals adjusted according to needs in the tool compared to being a static paper version. There was a clear demonstration of a need for the tool and further development as this version was only seen as prove of concept.

6   ACKNOWLEDGEMENTS

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