Change as a condition for the success of a project

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ABSTRACT

According to a methodical approach, the start of the execution phase of a project should be carefully planned, i.e. defined in deadlines and costs, as well as the rules for the implementation of the project from the technical side. However, as a rule the plans are estimates and projects are carried out in a variable environment, so the progress of a project is accompanied by a number of changes which may affect the achievement of the project's success. The paper analyses the principles of changes in a project. The subject of the analysis were approaches described in the literature according to different methodologies and also performed analysis for the implementation of changes in three infrastructure projects (case studies). As a result of these analyses the paper proposes an approach model towards dealing with change in an infrastructure project to achieve the planned success.

INTRODUCTION

The ancient Heraclitus of Ephesus considered changes to be an innate part of human lives and claimed that “everything changes apart from the law of change itself”. These claims are still valid today. Having in mind contemporary dynamically changing social and economic environment, one may assume that nowadays, change is as well inevitable. Subject literature contains a number of claims as to how economic organisations need to change in order to survive and succeed in market and financial terms. Yet another issue are changes in project delivery. Are they something normal and inherent to the project execution process? The answer is not simple and straightforward. Projects are delivered in changing social and economic environment, so it is hard to foresee changes to their course and outcome. Because of the fact that a project is a unique entity, whose course is planned and agreed upon with the sponsor, coping with change so that the goal of the project is achieved despite modifications is a vital issue. This was approached through review of the subject literature and researched in three large infrastructure projects whose outcomes were definite structures – a new train line in Gdańsk (Poland), a project for the construction of a football stadium and a project to construct a multifunctional, innovative building for the European Solidarity Centre in Gdańsk (Poland).

APPROACH TO CHANGES BY SELECTED METHODOLOGIES

The subject of analysis was the issue of changes in three descriptions of project management methodologies.
According to PMBOK® Guide (2013) the concept of introducing changes to a project is perceived within the scope of integrated change control. The grounds for defining changes are plans, information on control activity results within various areas of the developed project, and requests to introduce changes submitted by any interested parties to the project. The requests can even be of oral form, which however need to be put in writing afterwards. Each request document needs to be approved by the project’s leaders, with a special committee frequently needed to perform the task. Changes are designed based on the expert opinions or as part of the meetings of the change management team. All the decisions of the committee are documented and communicated to all interested parties.

According to the PRINCE2 (2006) methodology, change is one of the seven main topics, i.e. aspects of project management which need constant attention. According to this methodology, it is assumed that change is inevitable and reactions are needed so that it stays under control. The goal of change management procedures is NOT to prevent change, but to assure that each change be identified and approved prior to its implementation. Changes are to be considered only in the context of the state of things, such as the plan of a product. PRINCE2 methodology suggests an ordered approach to change management in a Deming cycle-based project.

PRINCE2 methodology additionally defines duties of the people involved in the introduction of changes, according to which the managing committee analyses and approves requests for change, but it is the duty of the project’s manager to undertake actions related to managing and introducing corrective actions.

According to the NCB (2008) approach, managing change is one of 20 technical (i.e. hard) competences of the project’s manager. The short description of project change stresses that “the effect of changes on partial products, configurations, timelines, costs, finance planning and the project’s threats and opportunities is defined through confrontation with the project’s base plan.”

Despite certain methodological differences related to the idea of change, the analysed methodologies emphasise the need for a formalised approach to the process of change management in combination with formal registration of the introduced changes. In the practice of project delivery, because of high dynamics of the course of a project and the fact that the need to introduce changes appears rather late as a rule, it is not always possible to follow all the recommendations of the formalised approach of the abovementioned methodologies. In order to react to the needs of introducing changes with advance and with adequate speed, simplifications are often adopted, as dictated by the requirements of the emerging situation.

**ESSENCE OF CHANGES IN A PROJECT**

According to the methodologies mentioned above, the requirements regarding the outcome of a project and the rules for its course are defined at the initiation (defining) and planning stages. These requirements and rules are written as plans, which – after being approved by the interested parties – form base plans. As a rule, further course of a project in its execution phase ought to follow the approved base plans. However, as has been already mentioned, because delivery of a project proceeds in a changing environment, despite its proper planning, during its execution a series of changes
occurs, of varying character, which are inevitable; this has been confirmed through the analysis of selected projects. Research also confirmed that changes to the course of a project must not be disregarded – in other words rejected the opportunity of being implemented – because the resulting project will not cater to the real needs and may even be stopped because of the inability to proceed further. On the other hand, it is not wise to follow all change requests, because uncritical introduction of all proposed changes may result in loss of control over a project, including exceeding the budget limits and deadlines, or even with a complete fiasco of a project. Changes in a project may even be a type of a challenge, because an efficient introduction of a change so that the approved base plans are maintained may be difficult. It is not a problem, for instance, to prolong the course of a project, but it is difficult to meet the previously defined deadlines despite introducing changes.

Changes to a project need to be perceived in a number of aspects which is a consequence of their complexity. The elements forming the changes within a project are presented in Figure 1.

Figure 1. Components of change within a project

Identifying and skilful balancing of the influence of these components on the change, and proper shaping thereof, may improve the chances of project’s success.

TYPES AND CAUSES OF CHANGES

The subject of analysis were changes that bear major impact on the course of a project. Minor scope and impact changes were omitted – these may be introduced by a project’s management as part of their authority over everyday operational activities; an example of omitted changes is a change in the course of work resulting from the temporary absence of one of the specialists or a minor technical modification that was a consequence of the availability of different material type.
Major changes to the course of a project are a consequence of events in the project environment, being external changes, and alterations within the project, or internal changes.

In the projects under scrutiny, the most frequent reasons for introducing changes were the following external factors:

- changes enforced through political factors, which was especially important for the analysis of large projects of major impact on a region or the whole country;
- changes of laws and legal regulations which occurred during the course of a project;
- technical progress which occurred between the production of executive documentation and the initiation of the execution phase, which in practice may be as long as a few years;
- changes to the location of the delivery of a project, such as learning new geological facts following tests, natural disaster, etc.;
- changes on the subcontractor market, including unsatisfactory performance of unreliable subcontractors;
- changes of “political powers” or events within the organisation responsible for the delivery of a project, such as ownership changes, alterations of the interests of various groups (including labour unions);
- weather conditions, which are vital for construction work in open air.

Changes to an ongoing project may also result from internal factors. Typical representatives thereof are:

- lack of precise wording in the contract between the sponsor and subcontractors regarding the details of the project;
- errors occurring when planning the course of a project and which became apparent during its execution, such as improper evaluation of manhours needed to complete a given stage;
- required error correction in the executive documentation of a project which became apparent at the execution stage, such as missing a component of a project;
- unavailability or delayed delivery of specific resources, such as unavailability of an adequate crane at a specific time;
- organisational difficulties following e.g. lack of specialists at a given point of time;
- deviations from base values during the execution of works, e.g. deviations to the use of allocated funds or used resources (more manhours were used for a given stage of a project due to low productivity);
- changes originating from the investor, such as abandoning certain concepts when the investor overestimated the scope of their project, or when new suggestions to the project are made by the investor;
- the general contractor seeking possibilities of improving their financial results from the execution of a project, e.g. when the initial version of a solution has been calculated with a low profit margin or with a loss. Introduction of new solutions remedies the inconveniences.
In the researched projects, changes of internal origin were more frequent than those driven by external factors. A useful skill of the management is the ability to quickly identify such events, i.e. finding the root of the changes, and the ability to make decisions on how to proceed in a given situation to avoid crises.

**MODEL OF CHANGE INTRODUCTION PROCESSES**

As a result of a case study of construction projects and interviews with the representatives of the individual project management representatives, main factors contributing to the success of introducing changes to a project have been specified. Based on the above, a triad of all the main change implementation processes has been constructed. The model is presented in graphic form in Figure 2. It exposes the so-called soft change markers, which as a rule involve the rules of conduct of the interested parties in respect to change. The so-called hard change aspects, such as the technical ones, timeframe of project delivery or the number of people involved in the implementation of the change are of secondary interest to the success of implementing changes. The presented model refers to the four main aspects of introducing change which are defined by four questions defining the course of action regarding change: WHAT will be changed in the course of the project? WHO will benefit from the change? WHEN will the change take place? HOW to implement the change?

**Figure 2. Model of the main processes of introducing major changes into a project**

The model allows to define the key factors determining the introduction of change and the rules of conduct when introducing changes. It may for a base for collecting questions in each area. The combined answers to the questions allow to assess the chances, i.e. whether implementing the suggested change is at all possible and what the critical factors in implementing the change are.
WHAT WILL BE CHANGED – TYPE OF CHANGE

The WHAT process focuses on the subject of the change. Within this process, the analysis of the subject, scope and type of change is undertaken, with the distinction between whether the change MUST or MAY be implemented.

Generally, changes can be categorised in the following way:
- regulatory and correction changes;
- improvements;
- combinations of the two.

Regulatory changes are all the initiatives resulting from the need to react to deviations from a project’s forecast course and having potential impact in a project’s success. They aim at correcting the course of the project to reflect the conditions and need to be implemented to avoid crises during its execution. Such changes are e.g. increasing the budget of a project if there is reason to believe the available financial resources will be too low in respect to the needs, or if the sponsor decides to limit the scope of the project reflecting lower available financial resources than previously planned. A radical regulatory change may be for example a decision to temporarily halt the progress of the project or decide upon its complete abandonment. Regulatory changes may be largely minimised through control activities of preventive nature.

Improvements are all kinds of initiatives that aim to impact the course or result of the project in a positive way. Most often they reflect technical aspects of the final outcome of a project. The originators of changes of this type are most frequently the either the sponsor or the customer. As an example, the customer seeing a gradually constructed project may generate ideas of new solutions – what if we do this in such-and-such way. The sponsor-customer very often has no idea regarding the consequence of the suggested changes on the course of the project, regarding timing, costs, etc.

Such changes may also be initiated by project management or subcontractors for individual stages of a project who – with their increasing experience – see the need of introducing new solutions, including:
- adjusting the results of the individual stages of a project to the current conditions, ideas, e.g. regarding lowering the costs of delivering a stage of a project;
- solutions resulting from the technological advancement, i.e. new technical and material solutions that have arisen in the meantime.

Improvements are categorised as changes that may be implemented in order to improve the course of the project or its end result.

Changes that are a combination of improvements and corrective actions have the highest chance of being implemented and as a rule have the largest impact on the course of a project. An example of a change in this category may be an introduction of new technology at the delivery of a single stage of a project that at the same time will remedy other possible delays. Such a change may be beneficial both for the contractor and the sponsor.

The WHAT process additionally analyses the impact of the change on the course of a project and the accordance of the change with the conditions specified in the
contract. Changes impacting the basic attributes of a project are especially dangerous, since they influence its scope, deadline or costs; here, it is worth adding that changing one of these basic characteristics of a project frequently results in altering all the others.

If chances for a regulatory change or an improvement are seen and the change is submitted, it is important to work out a solution that the change will encompass, i.e. determine the state of things at the end of the change. These will be the aforementioned hard elements of the change.

WHO WILL BENEFIT – CHANGE BALANCE

The WHO process focuses on the interested parties to the change. Within this process, an analysis of the main interested parties’ gains from the change is conducted, together with the analysis of possibilities of attracting the favour of additional interested parties. Any interested party to the project may initiate changes, but the success of a given change largely depends on the attitude of all interested parties who will be affected by the change or who may be interested in the final outcome of a suggested change. These parties, after the change has been initiated, prepare a profit and loss balance that they might experience after the change has concluded. Depending on who and how will profit or lose on the suggested change, attitudes of the individual interested parties towards the change are shaped and may influence the way of implementing the change and its future success.

The WHO process puts emphasis on defining and grouping beneficiaries of the changes who will definitely support their implementation. Frequent originators of changes are contractors and subcontractors of specific stages of a project. In the projects which have been analysed for the purpose of this study contractors suggested changes to technical solutions and very often in the way the project was being delivered, in contrast with the initial ideas. The project’s manager submitted the ideas to the sponsor for acceptance and initiated a joint meeting of the interested parties who would be influenced by the change. If during the negotiations the sponsor considered the change to be justified, they required sharing of the benefits. As an example, the use of a new technical solution in the construction of a bridge on a railway line as suggested by a contractor led to lowering the costs and shortening the deadline for the bridge’s construction. The sponsor agreed to the change requiring that 55% of the financial gains be distributed to the contractor, while 45% be spent on widening the scope of the project or using more expensive technical solutions at a different stage of the project. If, however, the investor suggested changes that would primarily bring profits to themselves, the interested parties to the change required in mutual discussions that they get a share in part of the profits. Such agreements were most frequently formed as part of a contract amount which was considered fixed.

WHEN TO CHANGE – THE TIME FOR INTRODUCING A CHANGE

The WHEN process focuses on the proper time for introducing a change. Part of the WHEN process is analysing the time to implement the change taking into account
the progress of a project. Each implemented change causes certain destabilisation and disturbance to the course of a project and these characteristics change with the progress of a project. Implementing some changes, especially improving on the result of a project, when the project activity is well-advanced may incur serious costs or the change may even be not feasible. Costs of implementing changes in the result and course of a project as a rule increase with the increasing progress of a project and may be very high near its end. Changes implemented at the planning phase do not incur high costs, because this phase of project execution contains mostly information and decision processes. This is visualised in Figure 3.

![Figure 3. Costs of implementing changes depending on the advancement of a project.](image)

Implementing a change in e.g. a product at the execution phase may be followed with a need to introduce changes to other areas of a project, resulting in potential high costs of implementing the original change. Paradoxically, in the researched projects it was observed that intensity of changes increased as the projects progressed, i.e. the later stage the project was at, the more requests for change were submitted. It was also observed that the faster the project work progressed, the harder it was to implement changes and also the longer a project execution stage took, the more initiatives for change emerged.

In order to keep the costs of implementing changes at a reasonably low level, and to keep the disturbances under control, project management introduced at one milestone the concept of “freezing” certain elements of developed solutions and halted the implementation of changes, especially of the improving category.

**HOW TO IMPLEMENT CHANGES**

The HOW process focuses on the way changes are implemented. On one hand, a change may be arbitrarily implemented through top-level decisions as part of a formal project management process. Such an approach may be found in the abovementioned project management methodologies.
Having in mind the profit and loss balance in respect to changes (see the WHO process) it is only natural that there may arise issues related to the implementation of changes and deriving from the attitudes and opposition of the interested parties who do not see any gain from implementing a given change. This is why soft rules of conduct when introducing modifications are important, related to the soft elements of project changes.

Part of the HOW process details building a consensus among the interested parties to the change, regarding the nature of the change, profits to the individual parties and the timing of implementing the change in the context of the project’s progress. Additionally, the change ought to be implemented in a controlled manner, so it is necessary to agree upon the details of the implementation process with the interested parties, as part of the HOW process.

According to the presented model, the basis for implementing changes to the course of a project are negotiations between the interested parties who will be affected by the change. Negotiations are initiated and conducted by the project managers and may occur as part of contractor meetings, usually taking place on a weekly basis. Results of the negotiations are written as official notes.

There are, however, situations where negotiations can become difficult. This may happen especially when the suggested changes provoke negative feelings of some of the interested parties who may not benefit from the change or whose involvement to the project needs to be increased (such as with increasing the workload). In such situations, implementing a change is a result of compromises developed during the negotiations that serve to lower the opposition of the parties resisting the change. An extreme situation occurs when the negotiations between the parties do not bring any result and parties may decide to resolve their dispute in court. An example of such situation is the abovementioned imprecise wording of the conditions of a project contract.

Below are some guidelines for the way to implement changes, identified in the researched projects.

• One must strive to implement changes to a project in a smooth manner, firstly informing in advance about the initiative for change, leaving the interested parties who the change will impact time to analyse the situation. Such an approach is especially important when the change will influence the situation of the participants to the project’s execution, e.g. when it requires overtime and weekend work so that the timeline of the project’s delivery is undisturbed.

• It is vital to distribute the information regarding the change. It is insufficient to prepare a note about the implementation of a change; instead, the interesting parties ought to be informed about the change repeatedly, together with the method of its introduction. Using Internet in contacting the interested parties is a good idea.

• It is advisable to group related changes.

• One should not wait until the need to introduce major changes to the project arises – it is much easier to implement changes of smaller scope. In the researched projects this was achieved through e.g. weekly meetings, part of which was the analysis of the course of the project combined with optional introduction of changes.

• It is advised that the project manager care of good relations between the interested parties, especially between the contractors for the individual stages and the
sponsor. Good relations may largely facilitate the general atmosphere which in turn may facilitate the negotiations regarding changes. In order to create atmosphere that, among others, simplifies the process of negotiating changes, contractors frequently struck more informal contacts with the representatives of the project management. However, for the good of the project, in two cases the managers regulated such contacts, limiting them.

Another issue is conducting the activity within a project in such a way as to minimise the cumber and scope of implemented changes. Within this issue, the following activities have been identified:

• precise and realistic planning of the course of a project in its planning phase. This approach is signalled in a series of subject publications and was proven in interviews with the management of the researched projects. Quality of activities in the planning phase has manor impact on the number of changes in the project’s execution phase.

• involving, for example at the contractor selection stage, future potential subcontractors for the individual fragments of the project so that they review the production documentation. This will serve to eliminate documentation errors and at the same time will make it more realistic at the time when the cost of implementing changes is relatively low (see Figure 3).

• implementing a relatively short planning horizon. As an example, planning of the overall course of a project is performed according to legal or organisational regulations, and afterwards, with relatively short advance time, detailed planning of elements of the project occurs, in regard to the overall progress. This way, the need to implement changes resulting from technical development may be avoided. A necessary condition for using this approach is the willingness to cooperate of the project management and contractor. When short planning horizons are used, the parties decide upon compromises within defined border conditions specified in a contract or at the earlier design phase.

**SUMMARY**

The paper presents model of handling changes in which much emphasis is put on the soft elements of changes. The model is based in the concept of four processes: WHAT? WHO? WHEN? HOW?

Changes to the course of a project are to be treated as something regular and unavoidable. At the same time, scope and frequency of changes depend on how professionally the project was prepared in its planning phase. Number of changes submitted to the project in its execution phase may be treated as a measure of the quality of preparation and execution of a project. An ideal situation therefore is that in which a project is executed strictly according to the primary plan.

**REFERENCES**