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The systematic integration of stakeholders into factory planning, construction, and factory operations to increase acceptance and prevent disruptions

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Abstract. The construction of factories is based on the factory planning process. A new construction of factories or their expansion represents a significant investment decision for companies. Therefore, it is necessary from an economic point of view to allow a trouble-free flow. Current trends, such as urban factories, increase the likelihood of conflict with external stakeholders. In many cases, this means high additional costs and risks for the companies concerned. The evaluation of current case studies shows that ignoring individual stakeholders during planning can lead to delays or, in the worst-case scenario, to the shutdown of the factory project. The aim of this article is to present the current state of stakeholder integration in factory planning, construction, and factory operations in research and practice. Based on the results of a research project in Germany, studies are presented and necessary fields of action identified. Subsequently, a concept is derived that facilitates the systematic and project-specific integration of stakeholders into the factory planning process.

Keywords: factory planning process, stakeholder participation.

1 Introduction

The construction of large infrastructure or building projects often leads to conflict with citizens or citizen groups. These conflicts have repeatedly escalated, culminating in violent behavior. A prominent example is the conflict surrounding the German infrastructure and railway project “Stuttgart 21”, which was accompanied by massive public – and partly violent – protests. Tens of thousands of citizens mobilized against the project, demanding an end to the construction works. Although the reasons for the resistance against the project are manifold, many opponents questioned the legitimacy of the project and even called for public participation in the decision-making process [1]. The public resistance even contributed to a change of the federal government and to the holding of a referendum on the project. Following the referendum, in which a majority voted to continue with the infrastructure project, the manifestations lost momentum [2]. The case of “Stuttgart 21” exemplifies how citizens increasingly demand participation in decisions over infrastructure and building projects. In many countries, policymakers

are therefore confronted with the pressure of introducing participatory elements into the decision-making process in addition to the existing representative democratic procedures [3], [4]. The degree to which individuals feel personally affected by a project often diverges from the “objective” or measurable consternation, e.g. local residents, which can be predicted by public or private project bodies [5]. A specific and comparatively well-researched phenomenon is the NIMBY (Not In My Backyard) behavior that has been observed in many conflicts surrounding public infrastructure [6]. The early integration of potentially affected citizens in planning processes may help to identify individual consternations and concerns, thereby preventing escalation processes. Psychological research emphasizes the role of trust in participatory processes [3]. The early integration of different stakeholders in the very early planning phase may avoid the consolidation of opposing coalitions and the formation of enemy images [1]. A specific challenge for participatory processes arises from their contradictory form of procedure: Although the possibilities to influence the project design are greatest during the early project phase, participation is often only envisaged for the later planning phases. The decreasing possibilities to influence the planning process in these later phases may lead to discontent among external stakeholders during the participation process and thus contribute to escalation. In the factory planning process, participation often only takes place with employees of the company. In many cases, external stakeholders are only involved if the participation of authorities, for example, is absolutely necessary in the context of approval procedures.

Compared to public project developers, private project bodies face an additional challenge. This challenge is particularly relevant in the case of construction projects in areas where local inhabitants are directly affected by the project, e.g. urban factories. Contrary to public projects, e.g. the construction of a public railway station, private projects rarely benefit the general public. The benefits of private projects are normally limited to private actors, whereas the costs must partially be borne by the general public, e.g. by local residents in the form of noise or air pollution or increased traffic. We argue that the unequal distribution of costs and benefits in the case of private projects increases the likelihood of resistance against the project by citizens and the risk of escalation. Our main argument is that the creation of general benefits by private project developers may decisively contribute to the approval of the project by external actors. In addition to the provision of individual financial compensations, which only benefit a limited number of actors, project developers should seek to create public benefits.

A second challenge relates to the different levels in the cost-benefit considerations [7]. The negative side effects of private construction projects, such as the building of a new production plant, often affect the local level only. Noise or air pollution are mostly limited to the local level, whereas the benefits in the form of economic gain are independent, i.e. they are transferred to the headquarters of the company. Even legally binding instruments, such as ecological compensation areas, are often created in other regions and thus do not benefit local residents. Accordingly, participatory processes must pay special attention to the local stakeholders and find ways to create private and public benefits at the local level, e.g. in the form of jobs or public goods. In Figure 1, these differences in costs and benefits between public and private projects are subsumed.

		Benefits	
		private	public
Costs	private	Compensation payments by private actors	Public participation and compensation payments
	public	Participation and private provision of public goods	Participation and public provision of public goods

Figure 1: Cost-benefit considerations in public and private projects (own compilation)

To solve the depicted conflicts of interests, we propose a combination of compensation payments made specifically to affected citizens, the provision of public goods, and public participation that is already in the early planning phase. Private project developers can use participatory instruments, such as neighborhood dialogues or roundtables, to create a basis of trust with external stakeholders and identify concerns and reservations regarding the construction project. Based on the results of the participatory process, external stakeholders can jointly decide upon the design and selection of compensatory measures in the form of public goods. There are a number of examples of excellent stakeholder involvement in the successful construction of factories in urban areas. In these instances, external actors were involved in the early phases of the planning process.

To gain a deeper understanding of the dynamics between project developers and external actors during private construction projects, we will firstly analyze the status quo of participatory elements in the factory planning process (see section 2). To explore how both sides – planning bodies and external stakeholders – evaluate the current situation, we present preliminary results of a survey conducted in 2018 (see section 3). The survey results indicate that external stakeholders increasingly demand participation and expect project developers to address their concerns personally. In addition, we present a concept for the integration of stakeholders systematically and project-specifically in the context of factory planning (see section 4).

2 Status quo of participatory elements in the factory planning process

When considering participatory research, different forms of participation in factory planning can be identified. Within the framework of participation in factory planning projects, existing findings focus on the involvement and participation of employees. [8] The participation of external stakeholders is rarely, if at all, addressed in the relevant literature. The current research project (see ACKNOWLEDGMENT) was the first to systematically highlight the relevance of various stakeholder groups to the factory planning process as well as their impact on the resulting costs, time and quality of the factory planning project. A detailed and up-to-date overview of the role of participation in the factory planning process is provided by Dombrowski et al. [9] The so-called "participation paradox" is evident in the participation of both internal and external stakeholder groups (see Figure 2).

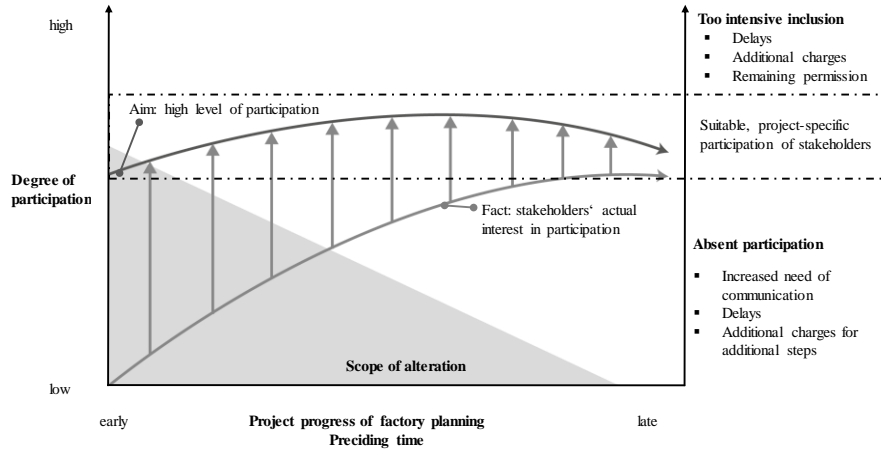


Figure 2: The participatory paradox of factory planning [9]

Accordingly, the actual interest of stakeholders in participating in the early phase of a factory project is very low. Stakeholder interest only increases as the project progresses. In the early phase of a project especially, the possibilities of influencing the project are highest and the resulting costs of change lowest. These findings already point to the necessity of establishing a systematic participation process. However, the degree of appropriate participation depends on the project and cannot usually be determined by companies. A lack of stakeholder participation in numerous projects usually leads to increased communication effort and delays in the factory project. Overly intensive participation results in additional costs and approval procedures. Here, too, project delays are likely. A higher complexity is added: Different process stages and their sub-processes within the framework of factory planning show different possibilities and potentials [9]

3 Selected results of the studies

Based on the problems described above (see section 2), several individual studies were carried out as part of the research project "Future Building Participation". The studies were conceived with the involvement of the project consortium with partners from planning offices, authorities, industry, and science. The survey was conducted throughout Germany. The studies are qualitative as well as quantitative surveys. Figure 3 summarizes further information on them. The quantitative studies are divided into two surveys (1). Within the framework of these two surveys, a total of 5,793 responses were collected within six months. Topic areas of the questions address the interaction between companies and stakeholders, the time and manner of integration, current obstacles and risks, as well as recommendations for participation. In addition to the current findings from the literature, the results of systematic analyses from a total of five case studies were used in the preparatory stage of the study (2). The results were supplemented and substantiated by ten expert interviews (3). The aim of the partial studies

was to obtain a comprehensive overview of the current deficits, to concretize them and to generate findings for the design of the action plan.

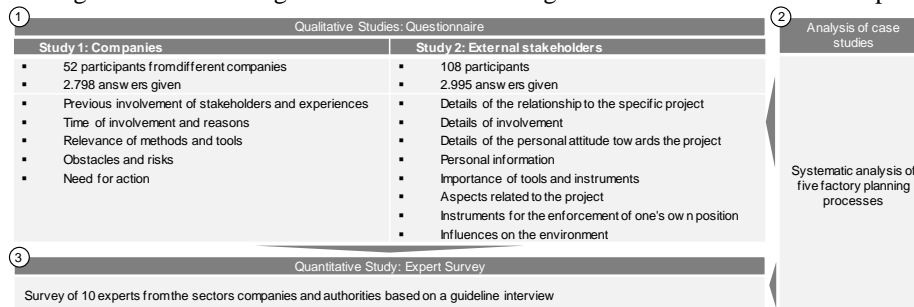


Figure 3: Overview of the studies carried out

To (1): The results of the two surveys clearly demonstrate the need for action. Overall, more than 50 % of companies state that they do not yet have a system, guidelines or other processes for involving external stakeholders. Without the necessary system, the integration process runs without standards and is conducted in a purely subjective manner by the responsible employee. In these cases, successful participation is not guaranteed and results as a random event. Necessary fields of action are shown in Figure 4.

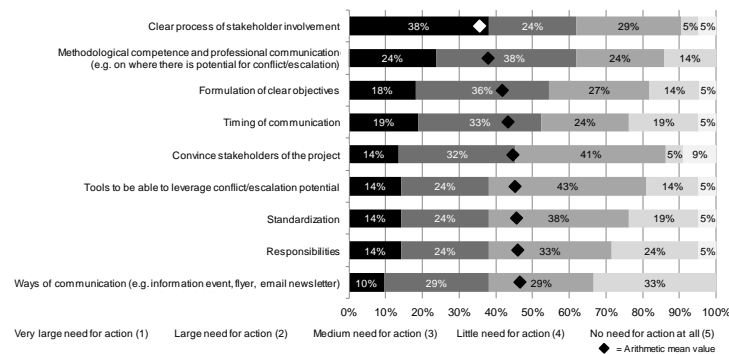


Figure 4: Need for action from the company perspective (n = 52)

According to the survey, over 62% of the companies see a need for major action in a transparent process to involve the stakeholders. The participants' entire planning process shows considerable deficits due to the lack of participation standards, which can lead to escalations with external participants, higher costs and lower planning quality. Without this standardization, management of participation remains impossible. This is confirmed by the survey, which criticizes the lack of clear objectives as relevant fields of action. Another important area of action is the required methodological competence. The lack of competence is closely linked to the implementation of communication. In this context, the time of communication can be identified as a relevant field of action. To which needs the transparent process must be geared towards remains unclear at this

point. In addition to the perspective of the company, a closer look at the external stakeholders is necessary. Figure 5 below shows the consequences that the surveyed actors would draw from mistaken participation.

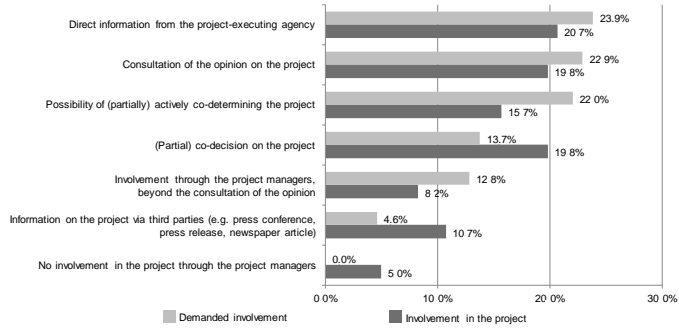


Figure 5: Desired and actual involvement in the project from stakeholder perspectives (n=108)

According to the respondents, greater participation in the planning process is required. Interestingly, the participants generally want a lower level of co-decision on the project. Rather, they would like to be informed directly by the project-executing agency. Having their opinions heard as well as the possibility of participating (partly) actively in the project are strongly pronounced wishes. These results play a major role in the design of the concept as they enable recommendations to be made on the degree of participation required.

To (2): As a result of the survey, the existing fields of action could be further concretized. On the one hand, relevant results are available. On the other hand, there is a lack of concrete technical content for the design of an action guideline. This is where the expert interviews come in. Partial results are summarized in Figure 7.

Subject areas	Fields of activity (excerpt)	Recommendations (excerpt)
Authorities / public offices	Building authority	Round table (in a timely manner) – approx. one year before the start of the project, get the authorities / public offices on board
	Water authority	Inform at an early stage w hich approval procedure is the correct one
	Industrial inspectorate	Contact the appropriate authority at an early stage
Communication with authorities	Numerous approval procedures	Star-shaped distribution of the corresponding documents
	Selection of correct documents	Contact the appropriate authority at an early stage
	Application requirements from authorities to plant operators often not feasible	Contact the appropriate authority at an early stage
Unfinished technical support	Electronic application under immission protection law (ELIA)	
	ELIA is not uniform (depending on federal state)	
Licensing procedures	Timely appointment determination with expert witness(es)	Initial status report (AZB); soil, noise and air pollutant immission forecasts
	Expert witness examination (every 5 years)	Arrange an expert witness in a timely manner for testing (sign long-term contract)
Federal Immission Protection Law (BImSchG)	Earlier start of construction (§ 8a) -> plant controller builds at his own risk	Involve expert witness for an extensive AZB
Time factor	Tight deadlines	Timely and intensive consultation with authorities, expert witnesses and the plant team
	Lead time for visiting authorities	Federal Nature Conservation Law (BNatSchG) and Federal Forest Law
Environmental protection	Breeding and settling times	Create compensation and replacement areas
	Species protection of animals and plants	External trainings/seminars for plant operators
Fire department	Permits for contaminated sites in the soil, wastewater plan or Ordinance on Installations for Handling Substances	
	Hazardous to Water (AwSV)	
Construction noise	Fire protection, escape plans and accessibility for the fire department	
	Ram probes	Announce and publish building projects and building progress and the next planned steps early on one's own website, in the local town hall, to city council members and/or via the media – round table
Public participation	AVV construction noise ≠ TA noise with regard to rest periods	
	Chemistry building	
Greater willingness of citizens to take legal action	Typical building site smell	
	Law suits delay construction progress	
State Administration Office	Citizens want to be noticed	
	Delays construction progress by unnecessarily leaving approval documents lying around for a long time	Early involvement of the State Administration Office

Figure 6: Structured results from the ten expert interviews (excerpt)

4 Concept

The approach consists of transferring the collected findings into a practice-oriented guideline for action. This guideline is intended to facilitate the project-specific involvement of stakeholders in factory planning and construction projects. Based on the results (see section 3) and supported by the participants of the project consortium, the four following fields of action could be summarized: "sustainable planning", "frontloading", "transparency and visualization" and "stakeholder orientation". The structure concept of Lean production systems (VDI 2870) was used for the operational implementation of the structure concept. The concept offers an ideal structure for operationalizing fields of action; it is already familiar to numerous companies and has established itself in operational practice. The structure is shown in Figure 7.

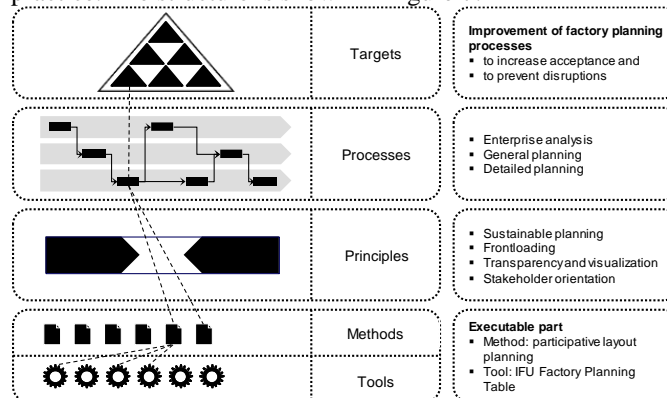


Figure 7: Structure of the Guide to Action (based on VDI 2870, [10])

5 Summary and outlook

The existing results provide the basis for the systematic integration of external stakeholders into the planning process of factories. In the future, it will be necessary to evaluate the methods and tools already identified for participation and to measure their influence on costs, time and quality. In addition, the concept must be fully validated in practice.

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geted involvement of experts in construction and planning processes. The resulting increase in acceptance should help to avoid long-term stress and resulting delays. Relevant results of the research project are to be prepared in a comprehensive and practice-oriented action guide to support companies in the project-specific integration of stakeholders into their factory planning projects. The project takes place from 08/2017 to 07/2019.

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