# Only Dynamics Can Absorb Dynamics

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**Abstract:** A study conducted in Israel, among ten excellent on-site construction project managers (PMs), examined the ways in which they cope with the dynamic project environment of the modern construction site (complex, uncertain, and fast). Empirical data gathered by means of structured observations led to the development of the Star Model, which offers a multidimensional description of the dynamic patterns of the managers' activities, namely, their managerial dynamics. In addition, characterization of the level of environment dynamics with which managers were required to cope in their work, led to the identification of a tentative relationship between contextual conditions that characterize the project environment and the level of managerial dynamics practiced by the managers. This tentative relation, which basically suggests that managers should adapt their level of managerial dynamics to the level of dynamics they find on-site, apparently holds one of the keys to the managers' excellent job performance.

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## Introduction

Mintzberg (1973) implemented the structured observation method in order to learn about the work of five general managers. His study, which produced a detailed, in-depth description of the management work displayed by the five managers for a period of 1 week per manager, revealed some revolutionary answers regarding the fundamental question: "What do managers do?"

Since Mintzberg's study, the technological revolution and globalization have fundamentally changed the business world. Work environments have become more complex and uncertain than ever before, and the centrality of speed in them has grown significantly. In other words, work environments in which managers are required to function have become more dynamic (Cappelli 1995; Wind and Main 1998; Royce 1999; Davenport and Beck 2001).

Global changes in the modern business world have not skipped over the construction industry, which has gradually opened up to a more refined competition; competition whereby many projects are released for execution before planning is complete, in order to enable the customer to gain market primacy. The rules of this market competition are dictated by customers who are becoming more knowledgeable and demanding, and are dictating new standards of quality, safety, and environmental preservation. At the same time, however, these customers are uncompromising in their demands of meeting tight schedules and rigid budgets (Baccarini 1996; Gidado 1996; Fryer 1997; Dulaimi and Langford 1999).

Although probably well suited to a static (stable, known, simple) environment, classic management textbooks and professional literature provide no useful guidelines for on-site construction project managers (PMs) who are required to function under dynamic conditions such as prevailing in the majority of today's projects (Akintoye et al. 2000; Nicolini 2001; Lingard 2003). Thus, Mintzberg's basic question, formulated in the late 1960s, "What do managers do?" has currently received renewed validity and serves as the basis for this research.

In order to better understand the nature of their work and the ways in which they cope with the dynamic work environment, detailed observations were conducted among ten leading PMs in their natural on-site work environment, for a period of 1 week per manager.

## Background: Emerging Dynamic Environment

The classical theory of management was formulated under the assumptions that work environments are relatively stable, known, and simple. Unfortunately, it is evident that although the world has changed significantly and the work environment has become more dynamic (complex, uncertain, and fast), the existing theory was not updated accordingly (Laufer and Howell 1993; Koskela and Howell 2002). As building projects today are more complex than ever before, both in their technical and organizational aspects, dealing with the complexity intensifies significantly in the presence of uncertainty (Baccarini 1996; Nicolini 2001; Lingard 2003).

Whereas in a relatively stable, known, and simple management environment, uncertainty can be reduced significantly by applying proper measures of planning and control, reality has proved repeatedly that in dynamic management environments,

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uncertainty is unavoidable (Laufer and Howell 1993; Morris 1994; Williams 1999; Koskela and Howell 2002).

As the modern market turns more client oriented, competition forces manufacturers to respond quickly and at times even change the product during construction in order to meet customer needs. The unavoidable result is inherent uncertainty (Cappelli 1995; Handy 1995; Royce 1999; Davenport and Beck 2001).

A study conducted, from the owner's perspective, among eleven Construction Industry Institute (CII) member companies from the United States, exposed the fact that owners sometimes simply cannot fully define their needs at the preliminary stages of the project (Laufer 1989). Some repercussions of these findings were evident in research done by Howell et al. (1993), which was based on a sample of 93 PMs in the United States construction industry, and which exposed that in 80% of the projects, high levels of uncertainty in project objectives were detected in the beginning of the on-site construction phase.

While planning tools and methods are constantly being developed and improve, research reveals that they do not offer immunity from uncertainty. As real life proves repeatedly, uncertainty is an inevitable aspect of most projects and its implications are found challenging even to the most proficient managers (Tatikonda and Rosenthal 2000; De Meyer et al. 2002; Browning et al. 2002; Sahlin-Andersson and Soderholm 2002; Laufer 2004; Laufer et al. 2005).

As complexity and uncertainty make the managers' job more difficult, the third component of the dynamic environment—speed—makes it even more difficult. Many authorities in the field of management define speed as the one single component that constitutes the most important basis for achieving a competitive advantage in the modern business world (Stalk 1988; Smith and Reinertsen 1991; Meyer 1993; Kelly 1998).

One of the main by-products of the speed factor, as distinguished by many management researchers, is the scarcity of time and attention; i.e., the shortage of time experienced by managers and their limited ability to allocate their attention to different issues that warrant their attention. In 1978, Economics Nobel Prize laureate Herbert Simon, as cited by Kelly (1998), explained that in a world of abundance, the only factor that will always be in short supply is man's attention—and the richer the former becomes, the shorter the supply of the latter. In his book, Kelly (1998) illustrated how, in current times, the forecasts of Simon came true in a rather extreme way.

In recent years, with the introduction of electronic information technology and the intensification of business competition, an increasing discussion has developed on subjects such as the "attention economy" and the "information overload." Essentially, this discussion indicates that in the modern economy, the most important resource is no longer money or some other tangible resource, but rather the individual's time and attention (Hudson et al. 2002).

Studies conducted in modern project settings have determined that successful management depends significantly on the managers' ability to gain the attention of others and, at the same time, to manage their own personal time effectively (Davenport and Beck 2001). Today, more than ever before, technology enables much more information and many more people to find us—and so, more and more people feel overwhelmed with information and short on time (Hudson et al. 2002).

Laufer (1996) explained that a PM's time scarcity intensifies with the increase in the uncertainty and complexity of the project. The manager is required to perform a large number of tasks in short time and to split his or her attention between many interdependent elements.

Based on the limitation of the existing theory and its implications, this paper examines some of the practices used by outstanding PMs in order to deal successfully with the unsupportive conditions presented to them by the combination of complexity, uncertainty, and speed, namely, dynamic work environments.

## Methodology

### *Learning from Successful PMs*

Many management researchers and scholars have dedicated their attention to learning from those people of action who excel (Peters and Waterman 1982; Kotter 1982a,b; Waterman 1994; Collins and Porras 1994; Bennis and Biederman 1997), and have imparted great importance to learning from select populations. The population of successful PMs possesses unique knowledge based on experience accumulated over many years of "doing" and learning lessons from successes and failures alike; therefore, learning from the best practitioners has proven to be a powerful methodology.

### *Research Method: Structured Observation*

Discussing the issue of uncertainty in management, Ward and Chapman (2003) encourage researchers to conduct more empirical research that examines ways of dealing with uncertainty in real-life settings. The present research embraced their recommendation and implemented the structured observation method. Mintzberg (1979) claims that this method enables both the flexibility of open-ended observations and the rigid discipline required in the search for structured information, such as is gathered in diary research. According to Mintzberg (1979), due to this combination, this method enables researchers to learn in a systematic manner, and at the same time encompasses those parts of the manager's work that are not structured or fully known. Stenhouse (1979) reinforced Mintzberg's claim by stating that due to the depth, the high level of detail of the data collected, and the authenticity that characterizes the method, it can be used to express great sensitivity, to diagnose and express complex situations, and to arrive at new insights regarding relationships and unknown variables of the phenomenon examined.

Many other researchers made successful use of the structured observation method. Among these studies, are those of Guest (1956), Jasinski (1956), Ponder (1957), O'Neill and Kubany (1959), Landsberger (1962), Mintzberg (1973), Sproull (1984), and Gonzalez and Mark (2004).

### *Field Work: Stages of Execution*

The research project was executed according to the following stages.

#### Selection of Population of Excellent Managers for Observation

The selection process was uncompromising in finding excellent PMs, who work in state-of-the-art construction companies, and who execute challenging (large and complex) buildings (rather than infrastructures, for example). Since the aim of the study was to learn from excellent practitioners, the selection of the ten managers constituted a crucial key to the success of the study. The fundamental problem in this process was to establish criteria for an "excellent manager." As the existing theories of management





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**Table 1.** Project Profile

| | Project type | Description of facility | Built area ($m^2$) | Tender budget (million $) | Total planned construction time (months) | Percentage of project completed, relative to planned construction time, at time of observation (%) |
|---|---|---|---|---|---|---|
| (a) | Airport terminal | Passenger terminal including access routes, parking lots, and service facilities | 150,000 | 110 | 72 | 92 |
| (b) | Office building | Two towers, 32 and 28 floors, above five parking levels | 120,000 | 70 | 34 | 49 |
| (c) | Office building | A 40-floor tower above two commercial floors and six parking levels | 117,000 | 50 | 44 | 86 |
| (d) | Manufacturing plant | Main building with two 18-m high floors and three additional buildings | 56,000 | 50 | 30 | 80 |
| (e) | Office building | A 20-floor tower above six parking levels | 55,000 | 34 | 32 | 95 |
| (f) | Office building | A 30-floor tower above three commercial floors and one parking level | 50,000 | 37 | 32 | 97 |
| (g) | Office building | A 20-floor tower above three parking levels | 50,000 | 27 | 21 | 47 |
| (h) | Public museum | A complex of large exhibition halls, mostly underground | 30,000 | 22 | 44 | 34 |
| (i) | Office building | A 9-floor tower above four parking levels | 20,000 | 12 | 11 | 98 |
| (j) | Residential building | Two towers, 14 floors each, above one parking level | 11,000 | 6 | 18 | 22 |



were developed mainly to suit less dynamic environments, there was no way to conclude from it which features make a manager into an excellent one under dynamic conditions.

It was therefore decided to seek assistance from leading entities in the Israeli construction industry, who probably possess the best and most objective tools for selecting the most outstanding managers from among the rest. Accordingly, senior managements of ten leading construction companies in Israel were approached. All of these companies had a well-developed management culture and were all ranked among the 20 leading construction companies in Israel by the D&B Ranking (2002–2004). Five of the ten companies cooperated in prior research and therefore were easy to approach. The remaining companies were approached based on specific challenging projects they were constructing, such as the government centers in Haifa (Israel's third largest city) and in Tel Aviv (Israel's largest city), the new complex of the Yad Vashem holocaust memorial museum in Jerusalem, and the new terminal at Ben Gurion International Airport.

Representatives from each company were requested to choose one on-site manager who was considered to be the most outstanding of the PMs employed by the company, including freelancers.

The selection process was found to be hard and demanding, as it lasted more than 1 year and required the cooperation of some extremely busy people. It resulted in a varied population of ten male managers, ranging in age from 34 to 72, with between 7 and 46 years of experience. Table 1 presents basic data on the projects. It should be noted that the selection process determined most of the context variables (see Table 1) and this explains why, for example, four of the projects were documented at very advanced stages.

## Preparations Prior to Observations

In order to understand the goings on during the actual observation period, preliminary preparations were necessary. At each site, the researcher had to become familiar with the project and its environment. In addition, preparations were also required in order to relay and clarify the purpose of the research and its method to on-site personnel. Operatively, the preparations were conducted over an average period of 1 month per site, and included several visits to the site, conversations with the PMs and principal on-site crewmembers, tours of the production areas, and filling of data-gathering questionnaires regarding contextual conditions.

The last stage of the preparations at every site included an on-site pilot observation day, which served as a "general rehearsal." As a result, the environment became more accustomed to the presence of the observer, so that behavior during documentation was more natural. In addition, the pilot enabled the observer to practice documentation in the unique project setting and to deepen his understanding of events on site.

## Observations on Site

During the observation period, the researcher accompanied the manager throughout his entire workday, in a manner described in the literature as "like a shadow" or "like a fly on the wall." With minimal interference, he recorded, systematically and in great detail, the activities (meetings, tours, desk work, computer work, telephone calls, etc.) performed by the PM. Observations were conducted at each of the ten sites for one continuous workweek, focusing on the activities of the PM himself, and not of his surroundings. In order to respond to the large number of focal points and descriptive questions addressed in the study (Telem 2005) (of which only a fraction are presented in this paper), rich and detailed textural descriptions were made during the observation of the goings on, with awareness to information relevant to the study objectives. Documentation was done using simple and reliable equipment—pen and paper—that served the research needs optimally as it was less intimidating to the observed persons compared with audio or video documentation. Moreover, the pen and paper were also less sensitive to the on-site conditions, as the documentation sometimes took place while walking on scaffolds, climbing ladders, in severe weather, and in other rough and rather messy surrounding site conditions typical to building sites.

## Encoding

Analyzing the data required a basic unit of analysis, which both could be identified in a clear-cut and objective manner and potentially accommodates a meaningful multifaceted analysis. The unit of analysis chosen in this research was *activities*, which were



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defined based on the mode of work used by the manager (i.e., meetings, tours, telephone conversations, and so on). In the case of meetings, beside the mode of work, a change in the composition of the participants marked the end of one activity and the beginning of the next. According to this definition, activities performed by the managers were documented and counted. The encoding was done for each activity by assigning values to relevant variables (mostly binaries) in order to provide quantitative measures of the related subquestions, such as are presented in the Findings chapter. A total of 4,544 activities were documented and encoded in the research. This paper focuses on the dynamic working patterns practiced by the excellent PMs. The rest of the data gathered in the research, regarding topics such as planning and control, implementation (result-oriented focus), attitude (the "will to win"), and team work, are presented by Telem (2005).

### *Sample of Ten Managers*

In-depth studies, as the current one, produce rich and detailed data, but are also highly demanding in terms of the researcher's time and energy. Therefore, this type of research usually includes a small sample of 4 to 10 individuals.

Mintzberg (1973) himself composed his much-quoted doctoral thesis based on a small sample of only 5 managers, which he observed for only 1 week each. Following Mintzberg, a tradition of small sample, in-depth field studies was developed. As part of this tradition, Morris and Hough (1987) investigated eight large projects in Great Britain; Hughes (1989) studied only four projects; Tatum (1983) studied eight; and Sproull (1984) studied seven junior managers in public organizations. Dozens more examples are presented by Panko (1992) in his comprehensive overview of managers' time management.

## Findings

### *Overall Impression*

The observation revealed a remarkably active work style displayed by the PMs, who, on average, conducted each day 42 meetings, 28 phone calls, and 17 tours to the site production areas, devoted 17 activities to paper and computer work, and barely spent any time purely on reflection during their presence on site. Moreover, these activities were sometimes preformed simultaneously: managers spoke on the phone while conducting meetings or while touring on site, performed paper work and computer work in an integrated way, etc. While executing their assignments, they switched between different topics and different associates at a high frequency and performed their activities in an extremely brief manner. The average duration of their activities was about 5 min, and about 90% of the activities they performed lasted less then 10 min. On the other hand, the managers conducted their work largely in a calm way and with a lot of self-control (only 7.5% of the activities were performed in a negative atmosphere, namely, anger, tension, or hostility, and in only 4% of the activities a loud tone of voice was used).

Findings of this nature gave the clear general impression that the on-site PMs were all acting in a dynamic nature. Much like Mintzberg (1973), activities preformed by the managers were found to be brief, fragmented, and varied, but also included a great deal of physical movement and changes of topics, which seemed to be synchronized with the changes on site.

The Star model, with its six indicators of managerial dynamics, was the way chosen to represent these general impressions in the current study.

### *Variables: Defining Six Indicators of Managerial Dynamics*

Following is a brief explanation of the six indicators of managerial dynamics, which together constitute the Star model. It is important to understand that the six indicators present different aspects of the managers' work that are not necessarily independent. Moreover, the central indicator is the most general and therefore, as it increases, so do the five other indicators, which are more detailed descriptions of a specific element of the managerial dynamics.

#### Central Indicator: Average Number of Activities per Hour

This indicator, chosen as the central indicator of the managerial dynamics, gives an indication of the average number of activities per hour performed by the managers, and includes the total number of meetings, phone calls, tours, paper work, computer work, and breaks.

#### Average Duration of On-Site Touring, Minutes per Hour

During the observation periods, durations of tours made by the managers were documented. Walking about the site and gathering information directly by observing and sensing was found to be an essential factor required by the manager in order to complete the data obtained by other means. Touring the site—for example during concrete casting, erection of formwork, or the preparation of a room for final quality inspection—provides a first-hand (direct), multidimensional picture of the execution (on-site production), with an integrative and simultaneous examination of the various disciplines, in addition to any other specific emphasis desired by the manager.

#### Average Number of Location Changes per Hour

In addition to the former indicator, on-site touring, this is another indication as to the manager's physical movement at work. This indicator systematically counts the location changes made by managers in their movement between the four following locations: their personal offices, other on-site offices, on-site production areas (i.e., the constructed facility and staging/storage areas), and off-site locations.

#### Average Number of Activities per Hour Initiated by Manager

This indicator measures the extent to which managers initiate activities. Initiatives on the part of the manager were identified and documented when it was clear, beyond reasonable doubt, that the observed manager indeed served as the motivating force leading to the execution of the said activity. From a behavioral viewpoint, this was manifested in several ways, including for instance, entering someone else's office without prior coordination and starting up a conversation with that person; making outgoing phone calls to certain entities (who did not ask to be called back); touring the site without being guided by others; and so on.

#### Average Number of Focus Changes per Hour

This indicator measures the shifting of managers between the following three main focus levels:

1. Viewing the project from a high and comprehensive observation point and regarding the project as a whole; for ex-



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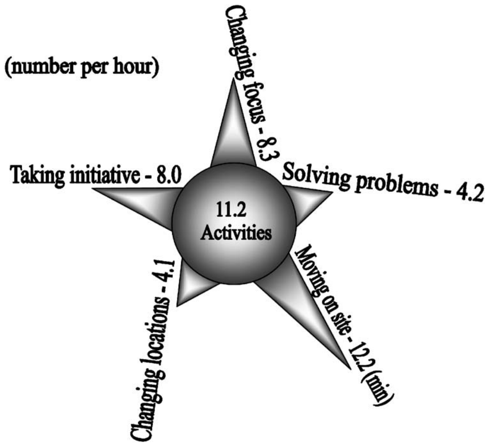


**Fig. 1.** Star model of ten excellent managers

ample, dealing with the total number of workers on site, examining the project financial balance, etc;

2. Viewing the project from an intermediate observation point and regarding different parts of the project at a time, such as different sections, systems, floors, etc; and
3. Viewing the project from a narrow observation point and regarding the project in an individual manner that focuses on single components, such as a single beam, a pipe, a screw, etc.

During the observation period, changes between these three levels of focus were documented both while performing activities and while transitioning between the activities. Thus, for example, if the PM discusses the ordering of a specific material required to clean a stain on the floor of the building's main lobby with the site engineer, and then immediately asks him to calculate the total quantities of steel needed for the entire structure, this would be documented as a change in focus between a narrow and a comprehensive observation point during the execution of the activity. If, for example, the manager concludes that meeting and then turns to the phone and urges the architect to expedite the planning of the 11th floor, then the shift between the activities would be documented as a change in focus between a comprehensive and an intermediate point of observation.

**Average Number of Problems Dealt with per Hour**

The responsiveness behavior of the managers in face of the dynamic conditions was measured by documenting the number of activities per hour dedicated by the managers to dealing with what was regarded by them as problems. The documented problems were related to different aspects of the project, and they included, for example, attending a leaky water pipe, the absence of workers from the site, overruns in the monthly budget, collision in the superposition between the systems of the building, etc.

## Star Model

The Star model, presented in Fig. 1, describes all six indicators of the managerial dynamics in a single visual presentation. The Star model emphasizes one central indicator (number of activities per hour) at the center of the model, and simultaneously presents the various aspects of the managerial dynamics in the circumferential rays.

In order to obtain a clear feeling of the dimensions involved in the model, it was decided to express all indicators in per-hour units and describe them graphically in scale. The physical expression of indicators using the diameter of the central circle and the length of the circumferential rays enables easy visual comparison between different "stars" (e.g., that relate to different PMs, or to one PM in different projects or contextual conditions).

The power of the Star model is that it enables one to obtain an immediate and multidisciplinary impression of the level of dynamics present in the manager's work and thus provides the ability to compare "stars" both in an overall manner (by comparing the central indicator) and in relation to each aspect separately. Various comparisons of the dynamic level can be made, such as a comparison between different managers (see Fig. 2).

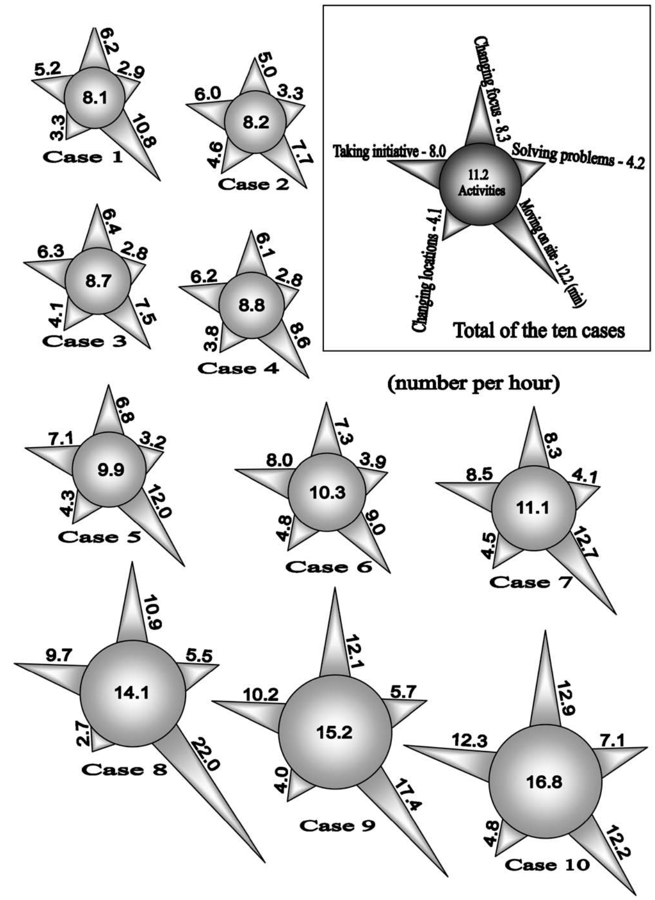


**Fig. 2.** Managerial dynamics exhibited by ten managers observed

### *Managerial Dynamics of Ten Excellent On-Site Construction PMs as Group*

The research findings (see Fig. 1) show that the managers conducted an average of 11.2 activities/h, that is to say, changed their mode of work, transitioning between meetings, tours, phone calls, paper work, etc., about every 5 min on average. It was found that managers changed their physical location once every 15 min on average, dealt with an average of 20 different problems each day devoting an average of 4.2 activities/h to solving them, and changed their focus in relation to the project once every 7 min on average. Moreover, it was found that the managers initiated an average of 8.0 activities/h, which constitute over 70% of the total activities performed by the managers.



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### Managerial Dynamics of On-Site PMs as Individuals: Ten Case Studies

Fig. 2 presents the managerial dynamics exhibited by the managers in their work using ten stars, in an ascending order of dynamics. In addition, the average managerial dynamic score of all ten managers, as a group (i.e., a reduced size Fig. 1), is presented at the upper right hand corner of Fig. 2, serving also as a legend for the rays of the stars.

From Fig. 2, it is clear that the ten managers did not display an equal level of managerial dynamics, as the most dynamic of the managers (Case 10 displayed in Fig. 2) conducted, on average, more then twice as many activities than the manager exhibiting the weakest dynamics (Case 1 in Fig. 2). These dramatic differences are discussed later in this paper, by analyzing the impact of the projects' context on the managers' level of activity.

**Table 2.** Scale Used by Managers in Scoring Environment Dynamics

| Evaluation of factor's impact on level of project's environment dynamics | Grades |
|---|---|
| Increases radically | +5 |
| Increases very significantly | +4 |
| Increases significantly | +3 |
| Increases moderately | +2 |
| Increases slightly | +1 |
| No impact | 0 |
| Decreases slightly | −1 |
| Decreases moderately | −2 |
| Decreases significantly | −3 |
| Decreases very significantly | −4 |
| Decreases radically | −5 |

## Environment Dynamics of Project: Analyzing Context

A literature survey on the topic revealed that no accepted methodology existed that could be adopted in order to evaluate the dynamics level of the project environment. Consequently, a suitable indicator had to be specially developed to suit the specific needs of the study. The first step was to formulate a list of factors that influence the environmental dynamics of construction projects. Tables 3 and 4 present a summary of the context factors documented, which are presented in three main groups according to the definition of project dynamics as the combined effect of complexity, uncertainty, and speed.

After formulating a list of factors that potentially influence the project's level of environmental dynamics, the next stage was to generate a way of combining those factors, by giving each factor its suitable weight and a suitable scale of grades. The aim was to create a single indicator that would represent the overall dynamics level of the project's environment. Developing the indicator proved that there is no one best way to assess the level of environmental dynamics, as different approaches can equally be applied. Accordingly, it was decided to develop two different indicators, later referred to as Indicator Nos. 1 and 2, which were used separately to measure the level of dynamics of the project's environment—each having its own advantages and shortcomings.

### Indicator No. 1 of Environment Dynamics

In formulating Indicator No. 1, as presented in Table 3, a similar relative weight was given to all context factors and relevant scores were determined according to clear and detailed criteria, which are explained as follows for each of the contextual conditions.

**Factors Representing Complexity**

1. *Project size:* Medium-sized projects (up to $25 million), which were defined as the norm, received a score of [0]; large projects ($25–50 million) received a score of [+1]; and exceptionally large projects ($50 million and more) received a score of [+2].
2. *Execution stage:* If the observation week corresponded primarily with the skeleton (i.e., building frame) stage, a score of [0] was given. More advanced stages, in which the skeleton was executed in parallel to the finish works or stages consisting only of finish works, received a score of [+1].
3. *Degree of repetitiveness of the project:* Projects in which the degree of repetitiveness (e.g., repetitive floors in a high-rise building) was rated high received a score of [0], whereas projects in which the degree of repetitiveness was rated low received a score of [+1].
4. *Exceptional congestion of the site and its surroundings:* Exceptionally confined and congested sites received a score of [+1], all others—[0].

**Factors Representing Uncertainty**

1. *Incompleteness of planning during construction:* Projects in which the planning was not yet complete during construction were given a score of [+1], all others—[0].
2. *Frequent changes in planning during construction:* Projects characterized by frequent changes in planning during construction received a score of [+1], all others—[0].
3. *Weather influences:* When the weather influenced the goings on in the site, the project was given a score of [+1], the score given for all other cases was [0].
4. *Special and unfamiliar technology:* Construction sites on which common and well-known technologies were employed were given a score of [0]. Projects in which special and unfamiliar technologies were used were given a score of [+1].

**Factors Representing Speed**

1. *Special time pressure (nearing a project deadline):* Projects that were approaching deadlines (i.e., characterized by a strong sense of time "bottleneck") were given a score of [+1], all others—[0].

**Special Factors**

At some of the construction sites, unique contextual conditions that affected the level of environment dynamics were found. Such factors were documented and are presented in separate columns in Tables 3 and 4.

### Indicator No. 2 of Environment Dynamics

Indicator No. 1 was calculated based on context factors given an equal relative weight and a rough scale of grades (mostly alternating between −1, 0, and 1). Since Indicator No. 1 hardly involves any subjective speculation, it has the potential to give a relatively objective estimation of the project's environmental dynamic level. Apparently, this does not come without a price. The



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**Table 3.** Environment Dynamics Factors by Indicator No. 1 Vis-à-Vis Managerial Dynamics

| | Indicator No. 1 of contextual conditions characteristic of the dynamic environment—scoring using defined criteria | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Complexity | | | | Uncertainty | | | | Speed | | | |
| Case number | Project size | Construction stage | Degree of repetitiveness | Irregular crowding of the site and its environment | Special and unfamiliar technologies | Lack of complete planning during execution | Frequent changes in planning during execution | Weather influences | Irregular time pressure | Additional special data | Summary of Indicator No. 1 of environment dynamics | Central indicator of managerial dynamics |
| 1 | $27 million (large) [+1] | Mainly skeleton [0] | [0] | [0] | [0] | [+1] | [+1] | [0] | [0] | Client constraints [−1] | 2 | 8.1 |
| 2 | $50 million (very large) [+2] | Skeleton and finishes [+1] | [0] | [+1] | [0] | [0] | [0] | [0] | [0] | Client constraints [−1] | 3 | 8.2 |
| 3 | $70 million (very large) [+2] | Mainly skeleton [0] | [0] | [+1] | [0] | [+1] | [0] | [0] | [0] | None [0] | 4 | 8.7 |
| 4 | $34 million (large) [+1] | Finishes [+1] | [0] | [+1] | [0] | [0] | [0] | [0] | [0] | Questionable reliability of main subcontactors [+1] | 4 | 8.8 |
| 5 | $6 million (med.) [0] | Mainly skeleton [0] | [+1] | [0] | [0] | [+1] | [+1] | [0] | [0] | Learning stage of typical floor [+1] Poor pricing of project [+1] | 5 | 9.9 |
| 6 | $110 million (very large) [+2] | Finishes [+1] | [+1] | [0] | [+1] | [0] | [+1] | [0] | [0] | Bureaucratic management/ supervision system slowed the project execution [−1] | 5 | 10.3 |
| 7 | $22 million (med.) [0] | Mainly skeleton [0] | [+1] | [+1] | [+1] | [0] | [0] | [+1] | [0] | Well-functioning environment [+1] | 5 | 11.1 |
| 8 | $12 million (med.) [0] | Finishes [+1] | [0] | [+1] | [0] | [0] | [0] | [+1] | [+1] | Extreme organizational structure with no assistance given to manager in his work [+1] | 5 | 14.1 |
| 9 | $37 million (large) [+1] | Finishes [+1] | [0] | [+1] | [+1] | [+1] | [+1] | [0] | [+1] | None [0] | 7 | 15.2 |
| 10 | $50 million (very large) [+2] | Skeleton and finishes [+1] | [+1] | [0] | [+1] | [+1] | [+1] | [+1] | [+1] | None [0] | 9 | 16.8 |



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**Table 4.** Environment Dynamics Factors by Indictor No. 2 Vis-à-Vis Managerial Dynamics

| | Indicator No. 2 of contextual conditions characteristic of the dynamic environment—scoring according to managers evaluations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Complexity | | | | Uncertainty | | | | Speed | | | |
| Case number | Project size | Construction stage | Degree of repetitiveness | Irregular crowding of the site and its environment | Special and unfamiliar technologies | Lack of complete planning during execution | Frequent changes in planning during execution | Weather influences | Irregular time pressure | Additional special data | Summary of Indicator No. 2 of environment dynamics | Central indicator of managerial dynamics |
| 1 | $27 million (large) [+2] | Mainly skeleton [0] | [0] | [0] | [0] | [+2] | [+2] | [0] | [0] | Client constraints [−3] | 3 | 8.1 |
| 2 | $50 million (very large) [+3] | Skeleton and finishes [+2] | [0] | [+2] | [0] | [0] | [0] | [0] | [0] | Client constraints [−3] | 4 | 8.2 |
| 3 | $70 million (very large) [+3] | Mainly skeleton [0] | [0] | [+2] | [0] | [+2] | [0] | [0] | [0] | None [0] | 7 | 8.7 |
| 4 | $34 million (large) [+2] | Finishes [+2] | [0] | [+2] | [0] | [0] | [0] | [0] | [0] | Questionable reliability of main subcontactors [+2] | 8 | 8.8 |
| 5 | $6 million (med.) [0] | Mainly skeleton [0] | [+1] | [0] | [0] | [+2] | [+2] | [0] | [0] | Learning stage of typical floor [+2] Poor pricing of project [+2] | 9 | 9.9 |
| 6 | $110 million (very large) [+4] | Finishes [+2] | [+2] | [0] | [+2] | [0] | [+4] | [0] | [0] | Bureaucratic management/ supervision system slowed the project execution [−3] | 11 | 10.3 |
| 7 | $22 million (med.) [0] | Mainly skeleton [0] | [+4] | [+2] | [+4] | [0] | [0] | [+2] | [0] | Well-functioning environment [+2] | 14 | 11.1 |
| 8 | $12 million (med.) [0] | Finishes [+2] | [0] | [+2] | [0] | [0] | [0] | [+2] | [+5] | Extreme organizational structure with no assistance given to manager in his work [+4] | 15 | 14.1 |
| 9 | $37 million (large) [+2] | Finishes [+2] | [0] | [+2] | [+1] | [+3] | [+2] | [0] | [+5] | None [0] | 17 | 15.2 |
| 10 | $50 million (very large) [+3] | Skeleton and finishes [+2] | [+1] | [0] | [+1] | [+4] | [+4] | [+1] | [+4] | None [0] | 20 | 16.8 |

estimation proved to be rather rough in that it does not express with adequate sensitivity the fact that different context factors may have a different affect on each project and may change within a specific project at different points in time. This limitation was addressed, head on, in the development of Indicator No. 2, which bases its input on evaluations received from the managers themselves and which uses a much more sensitive scale of grades. In their evaluations of each context factor, managers were asked to take into account both the relative weight of each factor and the scores that indicate the level of influence, and to combine the two into a single grade. These grades were given by the managers according to a uniform scale presented in Table 2.



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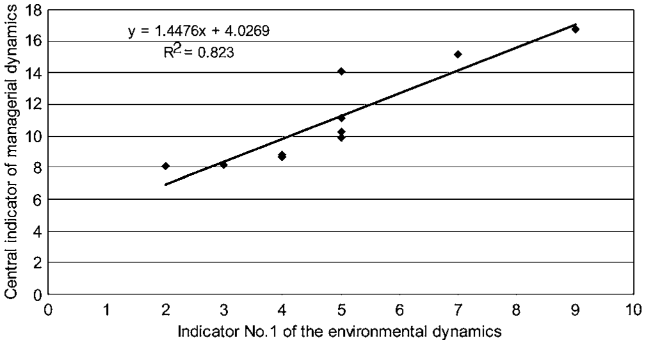


**Fig. 3.** Relationship between Indicator No. 1 of environment dynamics and managerial dynamics as measured on site

## Impact of Context Factors on Managerial Dynamics: Findings

The context factors gathered in this study were graded and summarized for each of the ten cases according to criteria defined for Indicator Nos. 1 and 2 (Tables 3 and 4, respectively). This information enables to investigate the nature of the relationship between the environmental dynamics and the managerial dynamics. Figs. 3 and 4 present the relationship between the summary values of the environment dynamics and the main indicators of managerial dynamics.

As $R^2$ values were found to be quite close to 1.0 in both cases (see regression graphs in Figs. 3 and 4), it became evident that, according to the behavior of the ten managers, a nearly perfect linear relationship was detected between the managerial dynamics and the environmental contextual conditions. The meanings and implications of these important findings are analyzed below in the "Discussion: Dynamic Working Nature of On-Site Construction PMs."

## Discussion: Dynamic Working Nature of On-Site Construction PMs

This research adopted the "action perspective" recommended by Eccles et al. (1992), in that it learns about management work from the observation and analysis of actions performed by individual managers while confronting challenges characteristic of the dynamic environment in which they function.

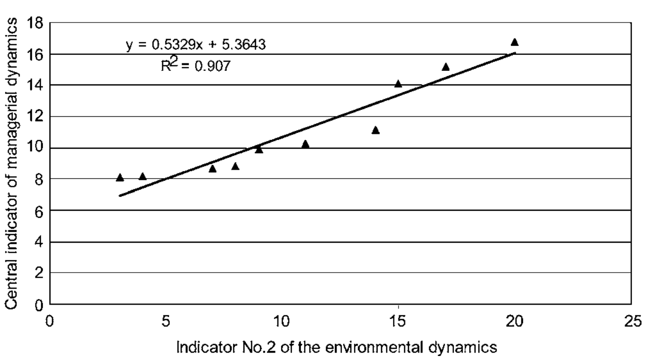


**Fig. 4.** Relationship between Indicator No. 2 of environment dynamics and managerial dynamics as measured on site

The findings led to the exposure of the active work practices implemented by on-site construction managers. Various earlier studies conducted among managers from various disciplines and managerial levels even prior to the evolution of the dynamic environments, also referred to the extensive activeness of managers in their work (Carlson 1951; Dubin and Spray 1964; Stewart 1967; Mintzberg 1973; Kotter 1982b; Sproull 1984, and others). These studies all found that managers perform a large number of activities within short periods of time.

In comparison, the activeness of the on-site PMs in the current study was found to be rather extreme. For example, whereas in Mintzberg's study (1973) about half of the activities preformed by top managers were completed within less than 9 min and about 10% of the activities lasted over 1 h, in the current study about half of the activities preformed by the on-site construction PMs were completed within less than 3 min and less then 1% of the activities lasted over 1 h. Furthermore, whereas the average activity duration according to Mintzberg's study was about 22 min, it was found to be only about 5 min in the current study.

These findings led the current study to focus its attention on the dynamics level of the managers in their work. After consolidating the concept of managerial dynamics and creating the Star model in order to describe it, the activeness levels of the ten managers were quantitatively examined. The examination exposed that the managers adapted their personal behavior to the specific environmental conditions. The managerial dynamics was reflected both in a great deal of doing and in constant change, physically as well as mentally: by frequent changes in the manager's mode of work, physical motion, change in focus, and attending to problems.

By performing managerial dynamics in significant intensity, but also adapted to the context, it seems that the excellent PMs succeeded in absorbing the environment dynamics and were able to create a more stable, certain and organized managerial environment for their subordinates. As a paraphrase on Ashby's (1956) well-known law of cybernetics—"*only variety can absorb variety*"—the main rule that results from the present research would be "*only dynamics can absorb dynamics*." Similar to Ashby, who stated that a system cannot cope with increasing variety in its environment unless it increases the range of its response repertoire, the findings of this research indicate that variety on behalf of the managerial system is not enough. This paper illustrates that managers facing dynamic environments must adapt their practice to the environment by operating in a way that is compatible to the tempo dictated by the environment. This claim is supported by Laufer and Hoffman (1998), who explained that, in a dynamic environment, one has to be just as "messy" as the surrounding situation. The current study showed that this "messiness" includes much more than variety. Similar conclusions were found in a publication by Eisenhardt and Martin (2000), who focused their research on the way in which organizations adopt different dynamic capabilities in face of moderately dynamic markets or high-velocity markets. Also focusing on organizations, Volberda (1992, 1998) presented the basic idea that equilibrium should be achieved by matching the flexibility of the organization to the turbulence of its environment.

This equilibrium was clearly exposed in the present research in the form of the almost perfect linear connection found between the environmental dynamics and the managerial dynamics. Indeed, the modest size of the sample does not enable drawing of strong statistical conclusions; however, the identification of this tentative connection must not be ignored. It is also important to note that the two indicators offered in this research for measuring



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the level of dynamics of the project environment were merely a preliminary and basic development. Hence, the tentative connection discovered in this research between the environmental and managerial dynamics should be further tested and refined in future research. This connection, however, which is based on the practice of excellent practitioners, most probably holds some of the elusive secrets to achieving success in project management in modern times.

## Conclusion

What seemingly looked like a kind of disorganized restlessness was revealed as a work style with clear characteristics that involved a great deal of action and change, both physical and mental, and was discussed in the paper under the term "managerial dynamics." Analysis of the ten excellent managers' activities emphasized that in dynamic work environments, effective practice must involve frequent changes in operating modes, constant changes in focus, taking a substantial measure of initiatives, attending to problems in real time, a lot of moving on site, and frequent changes of locations. Apparently, by not doing significant amount of the abovementioned, managers probably would miss a central element from their managerial work and may very well limit their chances of achieving success.

In addition, the relationship between the managerial dynamics exhibited by the managers and the dynamic environments was investigated. The phrase "only dynamics can absorb dynamics" was concluded accordingly, as an almost perfect linear connection was discovered between managerial dynamics and environmental dynamics. This conclusion states that the intensity of activeness of the manager's practices should be adapted to the contextual conditions, since by doing so it seems that managers succeed in absorbing part of the environmental dynamics and create a more stable work environment for those working under them.

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