Designing Organizations for Dynamic Fit: System Stability, Maneuverability, and Opportunity Loss

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***Abstract*—Fit represents a central concept for organizational design, but extant research maintains a static focus on fit, a focus that is incommensurate with the fundamentally dynamic nature of organizations and their environments. Most key organizational environments are inherently dynamic; hence, the corresponding organizational designs required for fit are necessarily dynamic too. The problem is, the dynamics of fit are not addressed well by extant theory in organization and management sciences. Alternatively, organizations can be viewed as systems of purposeful design, and designing organizations to maintain fit and respond to dynamic environments over time may be informed well by theory and practice in engineering fields where such design is well established. In this paper, we abstract to the level of airplane design, and we utilize the dynamical language and integrated system of concepts, definitions, and interrelationships from the engineering field Aerodynamics to extend organization and management sciences and address the problem of organizational design in a dynamic context. We begin with a focused summary of the literature regarding the nature of organizational fitness. We then outline a conceptual model adapted to organizational design from Aerodynamics, and we summarize the key aerodynamics concepts *stability* and *maneuverability* to inform our conceptualization in terms of both airplane and organization design. This paper enables us to articulate a set of propositions and measures that form a basis for empirical testing. This paper also reveals important, dynamic organizational design tradeoffs and implications, and it shows how such conceptualization can elucidate new insights via comparison with and extension to extant theory.**

***Index Terms*—Contingency Theory, dynamics, engineering, fit, organizational design.**

I. Introduction

FOR more than a half century, *fit*—which Donaldson [1] defines as a match "... between the organization structure and contingency factors that has a positive effect on performance" [1, pp. 7–10]—has been a central concept for organizational design. Beginning with seminal works by Burns and Stalker [2], Woodward [3], Lawrence and Lorsch [4], and others, organization and management theory has been guided by the understanding that no single approach to organizing is best in all circumstances. Lawrence and Lorsch [5] indicate that the "general notion of fit has become almost axiomatic" [5, p. xii] in modern studies of organization and management sciences.

Moreover, myriad empirical studies (e.g., [6]–[9]; cf., [10] and [11]) in the organization and management sciences have confirmed and reconfirmed that poor organizational fit degrades performance, and many diverse organizational structures [e.g., Functional, Decentralized, Mixed (see [12])], forms [e.g., Bureaucracy (see [13]); M-Form (see [14]); Network (see [15]); Clan (see [16]); Virtual (see [17]); Platform (see [18])], configurations [e.g., Machine Bureaucracy, Simple Structure, Professional Bureaucracy, Divisionalized Form, Adhocracy (see [19])], and other groupings[1] have been theorized to enhance fit. Quite simply, fit is a central concept in organizational design.

However, extant research maintains a static focus on *fit*; a focus that is incommensurate with the fundamentally dynamic nature of organizations and their environments [1], [20]. Most key organizational environments are inherently dynamic [21]; hence, the corresponding organizational designs required for fit are necessarily dynamic too [22]. This highlights the importance of research focusing on the design of organizations to maintain fit and respond to dynamic contingencies over time. The problem is, the dynamics of fit are not addressed well by extant theory in organization and management sciences [23], [24].

Alternatively, organizations can be viewed as systems of purposeful design, and designing organizations to maintain fit and respond to dynamic environments over time may be informed well by theory and practice in engineering fields where such design is well established. For instance, human-activity systems such as organizations, and engineered physical systems such as airplanes, bridges, and computers, all represent classes of *systems* [25] and share attributes at some levels of abstraction. The key is to find an appropriate level of abstraction for organizational design to benefit from well-established engineering knowledge (e.g., applied generally to physical systems) yet to account for essential idiosyncrasies of organizations (e.g., unique aspects of human-activity systems).

In this paper, we abstract to the level of airplane design, and we utilize the dynamical language and integrated system of concepts, definitions, and interrelationships from the engineering field Aerodynamics to extend organization and management sciences and address the problem of organizational

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[1] As a note, although we recognize differences in meaning between terms such as *organizational structure, form, configuration* and others [40], [45], [97]; unless the specific meaning is important to our argument, in this paper, we use them interchangeably for the most part.

TABLE I
SUMMARY OF PRINCIPAL CONCEPTS, ASSUMPTIONS, AND LIMITATIONS

Concepts	Proponents	Assumptions	Limitations
Org fit	[1]	Fitness affects performance	Static concept
Contingency	[2] – [4]	No single, best design	Unidimensional
Organizational environment & technology	[2], [3], [5], [26] -[30]	Organizational design affects performance	Exogenous focus
Multiple contingencies	[43] - [46]	Exogenous and endogenous, conflicting contingencies important	Static, equilibrium focus
Time as important concept	[23], [24], [41], [49]	Must adjust to changing contingencies	Dynamics not addressed well by extant theory
Misfit	[1], [20], [41], [44], [47] - [49]	Organization spends most time in misfit	Dynamics not addressed well by extant theory

design in a dynamic context. The airplane abstraction enables us to examine organizational design in terms of a controlled system that is subject to environmental dynamics. Moreover, the dynamical language of Aerodynamics enables us to obviate the static concept *fit* by developing organizational analogs to the fundamentally dynamic concepts *stability* and *maneuverability*, and its integrated system of concepts, definitions, and interrelationships inform the design directly and concisely.

To base this discussion on extant theory, we begin with a focused summary of the organization and management sciences literature regarding the nature of organizational fitness. This literature—in which most scholarly discussion of organizational design and fit takes place—is likely to be unfamiliar to many readers with engineering backgrounds. We then outline a conceptual model adapted to organizational design from Aerodynamics, and we summarize the key aerodynamics concepts *stability* and *maneuverability* to inform our conceptualization in terms of both airplane and organization design. These aerodynamics concepts—which are very well established in engineering theory and practice—are likely to be unfamiliar to many readers with organization and management backgrounds. Hence, our interdisciplinary discussion seeks to serve and inform readers from both engineering and organization and management. In turn, we articulate a set of propositions and measures that form a basis for empirical testing. This work reveals important dynamic organizational design tradeoffs and implications, and it shows how such conceptualization can elucidate new insights via comparison with and extension to extant theory.

II. BACKGROUND

In this section, we begin with a focused summary of the organization and management sciences literature regarding the nature of dynamic fit. To guide this discussion, Table I summarizes the principal concepts, assumptions, and limitations concerning the study of organizational fitness. To begin, we draw from Donaldson [1] for the fundamental definition of *fit* that centers on matching the design of an organization with its key factors that affect performance.

The next proponents introduce and discuss the term *contingency* to characterize key factors that affect organizational performance. They explain that there is no single organizational design that is best in all circumstances (i.e., across all contingencies), and they illustrate how various organizations are and should be designed and changed to fit specific contingency contexts. For instance, o*rganizational environment* is a fundamental contingency factor for organizational design [2], [26]–[28], with alternate environmental characteristics (e.g., *complexity, change*) related contingently with different organizational structures [e.g., *Functional, Decentralized* (see [12])]. Among others, *organizational technology* has been studied extensively as a powerful contingency factor also [3], [29], [30], with alternate technological characteristics (e.g., *task variability, problem analyzability*) related contingently with different organizational forms [e.g., *Craft, Engineering* (see [31])]. The principally exogenous focus of contingencies along these lines lacks explanatory power, particularly where management is viewed as working to purposefully maneuver and control organizations through endogenous activities.

In addition to exogenous contingency factors along these lines [e.g., including environmental shocks, technological shifts, and regulatory changes (see [32]–[34])], organizational forms are and should be designed and changed to fit endogenous contingency contexts as well, such as strategic choice [35]–[37], cultural change [38] and management intervention [39], [40]. Fit with endogenous contingencies is just as important as with their exogenous counterparts [41], [42].

Particularly, through the early phases of this research, the concept *organizational fit* has been treated in a unidimensional manner for the most part; that is, the early concept has been limited largely to describing fit between a specific organizational structure (e.g., Functional or Divisional) and a single contingency factor (e.g., *organizational environment* or *strategy*). However, scholars have identified an array of multiple contingency factors (e.g., *age, environment, size, strategy*, and *technology*), which are often conflicting [43]. As such, they must be addressed *simultaneously* as a multicontingency set [44] through holistic coherent organizational designs [45] composed of internally congruent elements [46].

Further, building recently upon such research, Burton *et al.* [41] identify a coherent set of 14 contingency factors (e.g., *goal, strategy*, and *environment*) that an organization must address in an integrated manner, and they explain how the specific contingency set facing a given organization can be expected to *change through time*; that is, the contingency context of organizational design is not static. Contingencies—and, hence, the corresponding organizational designs required for fit—are dynamic. However, most research on organizational design maintains a static focus [23], [24]; many scholars reject this view of fit as static equilibrium [1], [20].

Not only must management attempt to match the best fitting organizational form to the particular contingency set that is obtained at any given point in time (i.e., seeking the best static fit at each time period [41]), but it must also attempt to forecast the contingency sets likely to be obtained at future times, identify the corresponding best future organizational designs, and maneuver the organization over time (i.e., seeking to obtain the best dynamic fit across time periods). Hence, *time* emerges as a central concept—one that is not addressed well by extant theory [23], [24].

Additionally, assessing fit in such dynamic context is challenging. With multiple contingency factors in a set to address simultaneously, the organizational design task is more complex, and it becomes increasingly difficult to prescribe a single organizational form deemed to be most appropriate in the context of the whole set of factors.[2] Although equifinality considerations [44], [47], [48] suggest that different organizational forms may lead to equivalent performance under the same contingency set, this does not imply that *any* form will do; some combinations of contingency sets and organizational forms are likely to outperform others.

Moreover, with multiple contingency factors in a set changing through time, it becomes increasingly unlikely that any specific set of contingency factors will remain static for long, and we understand well how organizational redesign–reconfiguration is notably time consuming [49]. Hence, organizations are likely to spend much of their time in conditions of *misfit* [41]. This highlights the importance of research focusing on the magnitude and difficulty of correcting misfits over time.[3] However, the dynamics of organizational fit/misfit and redesign are not addressed well by extant organization and management theory [1], [20].

In Table II, we summarize the principal approaches to dynamic conceptualization of organizational design and fit. We begin with population ecology [50]–[52], which argues that some organizational populations (e.g., consider select organizational forms) are suited inherently better for certain ecologies (e.g., consider environments) than others are. Further, forces of *adaptation* (e.g., organizational variation, selection, and retention) work to preserve the populations exhibiting better fit and, hence, to alter the composition of organizational ecologies over time (e.g., with some populations destined to survive and others destined to fail).

With this ecological view [53], the dynamics of fit are deemed to manifest themselves via interactions between populations and their ecologies, over relatively long periods of time, and are insulated in large part from management influence; that is, most managers in relatively poor-fitting organizations are destined to see their organizations fail, whereas those in relatively well-fitting counterparts are destined to see theirs succeed. This perspective includes negligible opportunity for managerial intervention to address situations of misfit [54].

Alternatively, most contingency theorists maintain a teleological view [53], [55]: they see management in goal pursuit, taking action to adjust organizational structure in order to establish or reestablish fit. For instance, Burns and Stalker [2] suggest that organizations in misfit are expected to modify their structures to move into fit with their environments or other contingencies. This is an argument for endogenous organization change; one which suggests that organizational designs must change longitudinally (i.e., via managerial intervention) in response to exogenous shifts (e.g., in the environment) that cause an organization to fall out of fit. *Fit* remains a static concept in this view, however.

Similarly, set largely within a technological information-system context, Sabherwal *et al.* [56] embrace the punctuated equilibrium model [32], [33] to assess the alignment between strategy and structure, and they suggest that a dynamic realignment pattern may persist over long periods of time [57], [58]. Likewise, Romanelli and Tushman [34] embrace punctuated equilibrium also, suggesting that the large majority of organizational transformations take place via rapid discontinuous management-induced change. Peteraf and Reed [59] argue further how dynamic fit represents an important managerial capability for organizational change, highlighting in an argument against population ecology that fit trumps best practice. Moreover, organizational change to establish or reestablish fit can take considerable time [49]. As earlier stated, fitness and organizational change to establish or reestablish it are viewed statically: The organization falls out of fit, adjusts to regain fitness, and settles into another period of steady equilibrium.

Hence, in this dynamic view that considers lag time, in order to bring an organization into fit with a future and changing environment, managers must anticipate not only the environmental change but also the organization's resistance to and time required to effect change. Similarly, Westerman *et al.* [60] discuss how organizational designs that fit well with "early" strategic contingencies (e.g., in the early part of the innovation life cycle) can fall into natural misfit with "later" ones. They go further by

[2]The probability of the organization being in misfit with at least one factor is one minus the probability that the organization is in fit with all other factors simultaneously. For instance, with probability of misfit $= 0.2$ and the number of other factors $= 2$, this becomes $1 - (0.8)^2 = 0.36$ (i.e., 36% chance of misfit with at least one factor); with the number of other factors $= 13$, this becomes: $1 - (0.8)^{13} = 0.945$ (95% chance of misfit with at least one factor).

[3]As mentioned earlier, the probability of misfit is one minus the probability that the organization is in fit with all 14 factors simultaneously. With probability of misfit $= 0.2$, this becomes: $1 - (0.8)^{14} = 0.956$ (96% chance of misfit with at least one factor); with probability of misfit $= 0.5$, this becomes $1 - (0.5)^{14} = 0.9999$ (100% chance of misfit with at least one factor).

TABLE II
PRINCIPAL APPROACHES TO DYNAMIC CONCEPTUALIZATION

Research Stream	Proponents	Concepts	Assumptions	Limitations
Population Ecology	[50] – [52]	Organization population, ecology & adaptation	Some organizations inherently meant to succeed	Negligible role of management
Teleology	[2], [53], [55]	Teleological view Management role in change	Organizations are goal-oriented Endogenous organizational change	Static concept of fit
Punctuated Equilibrium	[32] – [34], [56]	Punctuated equilibrium	Steady equilibrium conditions for long periods, punctuated by rapid, discontinuous, management-induced change	Static, equilibrium focus
Organizational change	[41], [59], [60]	Organizational change	Organizational change is slow & costly, generally through series of static adjustments	Static, equilibrium focus
Dynamic Perspectives	[61]	Ambidextrous organization	Organization can operate simultaneously in multiple, often-inconsistent modes	Static, equilibrium focus
Complex adaptive systems	[20], [42], [62] – [65]	Fitness landscape	Describe fitness via smooth vs. rugged "landscape" of peaks and valleys; redesigns can range from local adaptation to reorientation	Change is very slow, and focus is on static fit
Robust transformation	[66]	Resilience capacity	No presumption of equilibrium; organizational flexibility more important than design	Abandons fitness as management goal
Organization semistructure	[67]	Balance organizational flexibility with order	Presumption of continuous change	Fitness as management goal unclear
Dynamic capabilities	[48], [74]	Market dynamism	Organizational processes enable capabilities; changing processes effects changes in capabilities	Unclear how to incorporate multiple contingencies

suggesting a tension between managerial approaches; one that requires some assessment of tradeoffs in this dynamic context: either seek to minimize the negative effects of misfit situations or seek to undertake timely organizational change. Burton *et al.* [41] address change over time as a sequence of adjustments. Again, as aforementioned, fitness and organizational change to establish or reestablish it are viewed statically: The organization falls out of fit, adjusts to regain fitness—albeit slowly—and settles into another period of equilibrium.

Tushman and O'Reilly [61] discuss ambidextrous organizations, which are able to operate simultaneously in multiple modes. For instance, an organization may take a relatively short-term focus on efficiency and control—essentially striving to exploit current organization and capabilities—while simultaneously taking a relatively long-term focus on innovation and risk taking—essentially striving to explore future organization and opportunities. They describe how an organization may even adopt multiple inconsistent architectures or structures to pursue this approach. This maintains a static equilibrium focus also. Although decisions and behaviors are made and examined over different time frames (particularly, short-term and long-term), both the short-term and long-term foci (i.e., both exploitation and exploration) concern static fit: Current exploitation fits current contingencies, and future exploration fits future contingencies.

Building upon the work of Kaufmann [62] on complex adaptive systems, several organization and management scholars [20], [42], [63]–[65] discuss the fitness of organizational forms as they adapt to changing environmental landscapes. Such landscapes can be characterized in terms of multiple contingencies [e.g., *production system variety, production system flexibility* (see [65])], and both external and internal fitness aspects are considered as they affect organizational performance, which can be viewed graphically in terms of "peaks," reflecting comparatively high performance.

As the environment changes through time, the "landscape" of peaks and valleys can shift and require an organization to redesign and reconfigure its form, either through "local adaptation" or "reorientation" [42, p. 945]. Relatively "smooth" landscapes reflect "robust" organizational designs where local adaptation through "hill climbing" can maintain relatively high performance even with gently shifting peaks and valleys. Alternatively, comparatively "rugged" landscapes require "long jumps" across peaks [20, p. 399]. In this view, fitness landscapes change very slowly and reflect punctuated equilibria as before, but the focus remains on maintaining static fit.

Along somewhat different lines, Lengnick-Hall and Beck [66] contrast the notion of adaptive fit—essentially shifting from one static-fit context to another over time—with robust transformation: "a deliberately transient episodic response to a new yet fluid equilibrium" [66, p. 742]. In this view, there is no presumption that specific environmental conditions will move to equilibrium; hence, organizational structures cannot be changed to achieve static fit. This represents a departure from most of the contingency research on fit and reinforces the idea that organizations spend most, if not all, of their time in conditions of misfit. Lengnick-Hall and Beck also introduce the concept *resilience capacity*, which implies a capability to recognize where objectives, such as responsiveness, flexibility, and an expanded action repertoire, are relatively more appropriate than seeking higher levels of fit over time is, along with the capability to select and enact the corresponding routines. Notice that this view essentially abandons the idea of management trying to establish or reestablish fit through organizational design or redesign; instead, it accepts an admittedly misfitting yet flexible organizational design.

Similarly, Brown and Eisenhardt [67] suggest that organizational semistructures, capable of balancing order and flexibility, provide a superior approach to highly dynamic environments. These proponents argue that continuous change represents a more appropriate perspective than punctuated equilibrium does. It also acknowledges the kinds of hypercompetitive (see [68], [69]; cf., [70]) and high-velocity environments that are in perpetual flux [71] and the kinds of nonlinear dynamic environmental patterns that never establish equilibrium [72], [73]. It remains unclear, however, whether fitness represents a management goal, as in most of the approaches earlier, or whether the goal of fitness should be abandoned in lieu of balance (e.g., between order and flexibility).

The dynamic capability approach [74] focuses on the ability of an organization to achieve new forms of competitive advantage (e.g., appropriate in shifting environmental conditions) and prescribes capabilities, such as timely responsiveness, rapid and flexible product innovation, and the management capability to coordinate and redeploy resources as key. Important in this approach is the concept *path dependence*: The options available to an organization depend upon past choices and events. Eisenhardt and Martin [48] augment this discussion by relating dynamic capabilities explicitly to organizational processes (e.g., product development, alliancing, decision making) and indicating how *market dynamism* influences one's approach to organizing; that is, consistent with Duncan's [12] model, dynamism of the environment (e.g., markets, in this case) represents an important contingency for consideration. In what they term as "very dynamic" and "high-velocity markets" [48, p. 1111], different dynamic capabilities (e.g., processes, such as rapid prototyping and early testing, real-time information, and pursuit of multiple parallel options) are required than in their "moderately dynamic" counterparts. As with robust transformation, multiple repertoires and scripts are called for, and this approach discusses attempts to balance competing effects of organizing with more versus less structure: ". . . if there were no structures, the processes would fly out of control . . ." [48, p. 1112]. As with the unidimensional approaches summarized earlier, it remains unclear how to incorporate multiple contingencies.

All of these theoretical contributions take important steps toward helping us to conceptualize fit in a dynamic context. However, each is constrained by limitations (e.g., negligible role of management, static-equilibrium focus, abandoning fitness as goal, and unidimensional). Moreover, it remains difficult to understand how to link even the individual conceptualizations directly to organizational design in a dynamic context. For instance, when is it better to change in search of fit with shifting contingencies or to maintain a misfit organizational form over time? Further, there is little insight into how one might draw from most such conceptualizations to articulate a set of measures for empirical testing. Our research goal is to address such limitations of extant theory and conceptualize the design of organizations for dynamic fit. As noted previously, we approach such goal by drawing from Aerodynamics and airplane design to inform organizational design.

III. Aerodynamics Concepts and Organization Analogs

Aerodynamics [75] concerns the motion of systems designed for flight (e.g., airplanes), most of which are highly dynamic controlled systems; that is, the systems themselves reflect inherent dynamic capabilities (e.g., speed, stability, maneuverability) that are designed in, but they receive directional inputs (particularly from pilots) during flight (e.g., taking off, climbing, turning). Airplane designers analyze the intended uses (e.g., family recreation, passenger transportation, military combat) and expected environments (e.g., clear weather, turbulent storms, hostile airspace) to tailor design characteristics and capabilities in a way that balances often-competing design goals such as system performance, reliability, and cost. As such, airplanes are designed deliberately to fit their intended uses (e.g., commercial aircraft versus military fighters) and expected environments (e.g., extreme weather versus enemy fire), and different designs are required to fit different use-environmental contexts; large commercial passenger jets are unable to land on aircraft carriers nor are naval fighter jets able to carry hundreds of passengers, for instance.

Human-activity systems, such as organizations, are not engineered physical systems such as airplanes, bridges, and computers, but they all represent classes of *systems* [25] and share attributes [e.g., recognizable inputs, outputs, boundaries and others (see [76])] at some level of abstraction [77]. Similarities and differences between system classes such as these have been articulated and elaborated for many decades, with a distinction between "organizations" (particularly the kinds of organizations discussed here) and "organisms" (e.g., the kinds of engineered physical systems discussed here) noteworthy [78]: "Whereas both are purposeful systems, organisms do not contain purposeful elements. The elements of an organism may be state maintaining, goal seeking, multigoal seeking, or purposive but not purposeful. . . . In an organism, only the whole can display will; none of the parts can" [78, p. 670]. Hence, we can ground our discussion well in the established system-theory literature and talk quite precisely about the goal-oriented design of organizations and airplanes as purposeful systems while recognizing clearly that the key elements of organizations (i.e., people) are purposeful and have will, whereas the key elements of airplanes (e.g., engines, wings, cockpits) do not share such properties.

Further, we see how organizations and airplanes are open systems [79], [80], which are engineered and managed [81]. Strategy is important in both domains [82], as organizations and airplanes are designed purposefully to interact with their environments in goal-seeking ways, but such systems are controlled [e.g., by managers and pilots, respectively (see [83])] both in anticipation of and reaction to shifting environmental conditions. Clearly, the degree of control that managers have over organizations (e.g., through decision making but particularly as composed of diverse and willful people with partially shared but varied goals) does not compare with that of pilots' ability to control airplanes (particularly as composed of highly predictable computational, electronic, and mechanical subsystems), so we acknowledge clear limits to the mechanistic decision-making analogy that we draw upon.

However, this discussion is much more about the *design* of organizations rather than their *control.* Hence, the analogy draws much more closely on *engineers* (i.e., who design airplanes) than on *pilots* (i.e., who fly them). Pilots do their best to control the airplanes that engineers have designed, but (in the short-term) they have negligible control over the designs themselves. Knowledge and expertise vary across these roles as well: Most airplane pilots do not have or require engineering degrees (e.g., they focus on airplane control) nor do most engineers have or require piloting licenses (e.g., they focus on airplane design). In this light, airplane designs can change over time—through learning and decision making—in reaction to shifting needs and conditions (e.g., changing missions, differing cost and passenger constraints, invention of new materials, and technologies).

Likewise, managers do their best to control the organizations as designed, but (in the short-term) they have negligible control over the designs themselves. To continue the role parallel, most organizational managers focus principally on control of everyday operations, whereas the process of organizational design is undertaken more by senior executives, consultants, and the like professionals who maintain a longer term, higher level, and more strategic perspective. In this light, organization designs can change over time—through learning and decision making—in reaction to shifting needs and conditions (e.g., changing markets, differing cost and production constraints, invention of new processes, and technologies).

When we use the term *organizational management* in this discussion, we refer to managers in a role comparable to that of a pilot: controlling an implemented system design through a process that takes place comparatively very quickly. When we use the term *organizational design*, alternatively, we refer to senior executives, consultants, and the like professionals in a role comparable to that of an engineer: analyzing, specifying, and implementing system capabilities through a specific design point and a process that takes considerable time.

In the rest of this section, we conceptualize a basic model and then illustrate the central dynamic concepts *stability* and *maneuverability* through comparison of dynamic trajectories corresponding to airplane and organization designs. Such illustration provides concrete examples, stimulates insight, and enables us to develop research propositions that lend themselves to empirical testing. This section concludes with an extended conceptual model that reflects these examples, insights, and propositions.

A. Basic Conceptual Model

The basic conceptual model is shown in Fig. 1. Through considerable simplification,[4] the aerodynamics concepts and relationships between *static stability, dynamic stability, maneuverability*, and *technology* are depicted in a manner that can apply to the domains of both airplanes and organizations. We diagram these central concepts and interrelationships as boxes and arrows in the figure and explain them hereinafter.

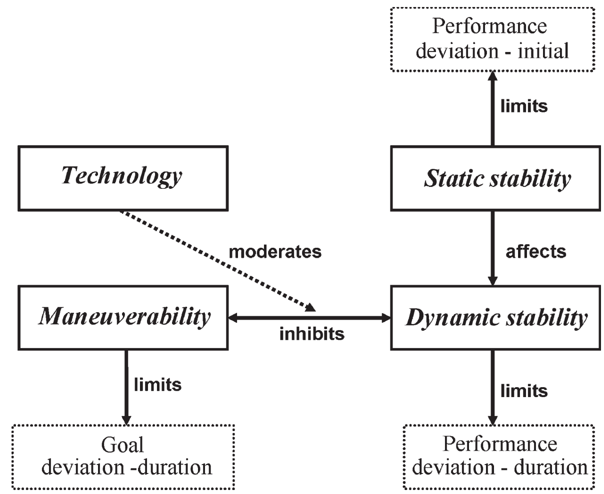

Fig. 1. Basic conceptual model.

Table III summarizes the four key-concept definitions and provides examples from both the airplane and organization domains. First, static stability, which concerns a system's initial resistance to deviation from its dynamic trajectory from an external force, maps from airplane design to organization design by considering performance. A statically stable airplane resists deviation from its intended altitude, for instance, by wind gusts, and a statically stable organization resists deviation from its intended profit[5] level, for instance, by changed consumer preferences. Hence, static stability limits initial performance deviation (e.g., maintaining desired airplane altitude or maintaining desired organization profitability).

Dynamic stability, which concerns the quickness of a system's return to its dynamic trajectory after deviation from an external force, maps from airplane design to organizational design by considering performance also. A dynamically stable airplane returns quickly to its intended altitude, for instance, after deviation by wind gusts, and a dynamically stable organization returns quickly to its intended profit level, for instance, after deviation by changed consumer preferences. Hence, dynamic stability limits the duration of performance deviation (e.g., maintaining desired airplane altitude or maintaining desired organization profitability).

Maneuverability, which concerns the quickness of a controlled system's planned change from one trajectory to another, is inhibited by stability, and vice versa: the more stable an airplane is, for instance, the less maneuverable it is, and the more stable an organization, for instance, the less maneuverable also. A maneuverable airplane can change direction or altitude, for instance, in response to the pilot's goal change, quickly, and a maneuverable organization can change product line or profit

[4]This is important, for our understanding of organizations as human systems does not support the kinds of precise mathematical representations and corresponding analytical methods used to model, design, and analyze airplanes and the like physical systems. Such simplification also facilitates translation of research along these lines to the management and organization domain.

[5]As a note, we can substitute a multitude of alternate performance measures for airplanes (e.g., heading, speed, attitude, fuel efficiency, or passenger comfort) or organizations (e.g., market share, cycle time, liquidity, operating margin, or employee welfare) to emphasize model generality.

TABLE III
CONCEPT DEFINITIONS AND EXAMPLES

Concept	Definition	Airplane	Organization
Static stability	A system's initial resistance to deviation from its dynamic trajectory from an external force	Initial resistance to deviation in altitude from wind gust	Initial resistance to deviation in profit level from change in consumer preferences
Dynamic stability	Quickness of a system's return to its dynamic trajectory after deviation from an external force	Quickness of return to initial altitude following a deviation from wind gust	Quickness of return to initial profit level following a deviation from change in consumer preferences
Maneuverability	Quickness of a controlled system's planned change from one trajectory to another	Quickness of planned change in direction	Quickness of planned change in product lines
Technology	Enhances control of a dynamic system	Computer flight control system enables human control despite quick direction change	Management information system enables human control despite quick product line change

level, for instance, in response to the manager's goal change quickly as well. Hence, maneuverability limits the duration of goal deviation (e.g., achieving a new airplane heading or altitude, achieving a new organization product line or profitability).

Finally, technology can enhance control of a dynamic system. Computerized flight-control systems, for instance, enable pilots to control highly unstable yet maneuverable airplanes (e.g., to maintain desired heading and altitude), and management information systems, for instance, enable managers to control highly unstable yet maneuverable organizations (e.g., to maintain desired product line and profitability). Hence, technology moderates the interrelation between maneuverability and dynamic stability.

Technology can play other roles as well, both in terms of the control and design of airplanes and organizations. Consider airplane simulators, for instance, which pilots use extensively to practice both routine and dangerous maneuvers in the safety of ground-based computer systems, with no risk to life or aircraft; likewise, managers can practice both routine and risky decision making, for instance, through organizational simulation systems [84], [85], with no risk to careers or profits. As another instance, consider computer-aided design and engineering systems (CAD/CAE) that enable engineers to evaluate the system properties and behaviors of myriad alternate airplane designs through corresponding virtual prototypes; likewise, virtual organization-design systems [86], [87] enable organizational designers to evaluate the system properties and behaviors of myriad alternate organization designs through corresponding virtual prototypes.

B. *Illustrative Airplane and Organization Trajectories*

The illustrative airplane and organization trajectories delineated and described in this section provide concrete examples derived from the basic conceptual model earlier mentioned. Such examples are kept purposefully very simple (e.g., linear motion, discrete time, single variable) to illustrate the key points of comparison and insights from our airplane–organization analogy. Given the considerable sophistication and empirical power of Aerospace Engineering, more complex applications are straightforward to conceive; we leave such conceptualization to future research.

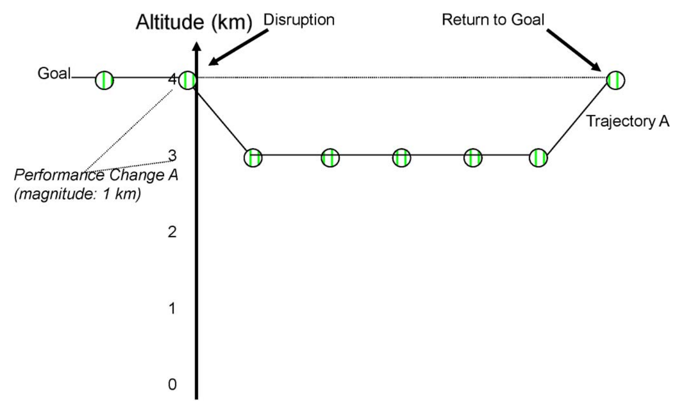

Fig. 2. Airplane A trajectory.

1) Static Stability: With considerable simplification of aerodynamic theory, we annotate Fig. 2 to delineate a very simple linear trajectory of an airplane (i.e., "Airplane A") in terms of the single variable *altitude* (in kilometers) over time. We use this and the like figures in the following for analytical description and conceptual illustration. The eight circular-plot points in the figure delineate the airplane's altitude at discrete times during flight. Beginning with level flight at the goal altitude of 4 km, the figure shows a disruption (e.g., wind shift) that changes the airplane's altitude from the goal to the 3-km level. This altitude change from the goal can be viewed as a 1-km performance deviation. *Static stability* characterizes how resistant airplane performance is to environmental disruptions; despite the word "static," this term describes a dynamic property of airplanes (i.e., resistance to disruption). Notice that such dynamic property is designed into the system by engineers and has little to do with the pilots who fly them.

In this example, the magnitude of altitude change (i.e., 1-km performance deviation) provides a basis for comparison with the static stability of other airplane designs. An airplane that experiences less altitude change from a particular disruption can be said to reflect greater static stability than an airplane which moves more (and vice versa). Indeed, an *ideal system* (e.g., perfectly stable airplane) would experience no altitude change from the disruption and, hence, not spend any time away from the goal. The horizontal dotted line in Fig. 2 shows how the trajectory of a perfectly stable airplane would remain at the 4-km altitude level and experience no performance deviation. The 1-km altitude change experienced by Airplane A reflects lesser static stability than that of an ideal system.

In terms of organizations, we annotate Fig. 3 to delineate a very simple linear trajectory of an organization (i.e., "Organization A") in terms of the single variable *profit* (in billion dollars) over time. The eight circular-plot points in the figure delineate the organization's profit at discrete times during operations. Beginning with steady profit at the goal level of $4 billion, the

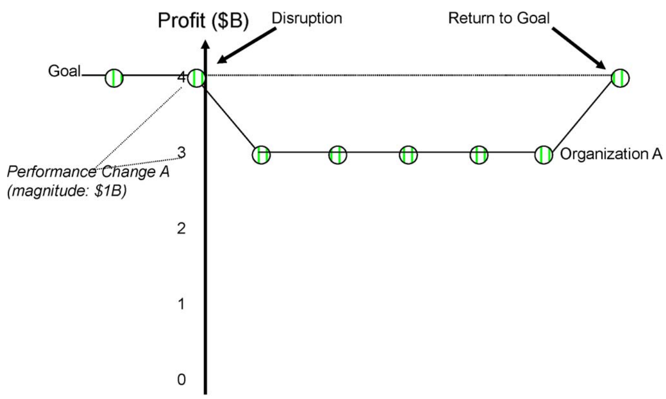

Fig. 3. Organization A trajectory.

figure shows a disruption (e.g., changed consumer preferences) that changes the organization's profit from the goal to the $3-billion level. This profit change from the goal can be viewed as a $1-billion performance deviation. *Static stability* characterizes how resistant organization performance is to environmental disruptions.

A key insight from our airplane–organization analogy emerges: the performance deviation associated with airplane static stability is analogous to the manner in which many scholars characterize the converse of organizational fit [1]: "misfit produces a negative effect on organizational performance" [1, p. 14]. Misfit is a deviation from the ideal or goal state and provides a basis for comparing the relative misfit of other organizations. An organization with greater performance deviation (e.g., from environmental disruption) is in greater misfit than one with lesser deviation. Hence, *static stability* and *misfit* represent relatively good analogs (e.g., see the first row of Table IV for summarization): The greater the static stability of an organization is, the lesser is the performance deviation it experiences from environmental disruption. This gives rise to our first research propositions.

Proposition 1a: A statically stable organization will experience less performance deviation from environmental disruption than a statically unstable organization will.

Proposition 1b: The degree of static stability associated with an organization can be quantified by the magnitude of performance deviation it experiences with respect to the performance of an ideal organization.

2) Dynamic Stability: Notice that the airplane static stability, as shown in Fig. 2, does not take into account the time in flight spent at an altitude below the 4-km goal. Even as a dynamic concept, it is insensitive to how quickly the airplane returns to its goal altitude: It addresses the magnitude of performance deviation but does not address *time*. The same applies to organization static stability shown in Fig. 3: It is insensitive to how quickly the organization returns to its goal profit level, and it addresses the magnitude of performance deviation but does not address *time*.

In contrast, as shown in Fig. 4, *dynamic stability* represents both the magnitude and duration of performance deviation (i.e., $1\ \text{km} \times 5\ \text{t} = 5\ \text{km} \cdot \text{t}$ altitude change for Airplane A) and characterizes both how much and how long the system performance is affected by the disruption: It measures explicitly how quickly the system returns to its goal altitude as well as the extent of altitude change. As stated earlier, the combined magnitude and duration of performance deviation provides a basis for comparison with the dynamic stability of other airplane designs. For a given altitude change from a particular disruption, an airplane that spends less time away from the goal can be said to reflect greater dynamic stability. When viewed in comparison with an ideal system (e.g., the horizontal line at goal altitude in Fig. 4), dynamic stability can be measured as the area between the ideal and focal system trajectories; the larger the area is, the lesser is the dynamic stability, and vice versa.

Further, Airplane A pays something of an instability penalty: Since it exhibits lesser dynamic stability than the ideal system does, it spends more time away from the goal altitude and incurs an opportunity loss during this period away from goal (e.g., consider burning fuel at a faster rate while at lower altitude). When viewed in comparison with the ideal system trajectory in Fig. 4, opportunity loss can be measured as the area between the ideal and focal system trajectories also; the larger the area is, the greater is the opportunity loss, and vice versa. Hence, as shown in the figure, we can relate dynamic stability to opportunity loss.

In terms of organizations, the dynamic stability concept incorporates *time* explicitly into our conceptualization. Most directly, we can characterize dynamic stability in terms of the combined magnitude and duration of an organization's performance deviation from the goal. When viewed in comparison with an ideal organization, dynamic stability can be measured as the area between the ideal and focal organization trajectories; the larger the area is, the lesser is the dynamic stability.

Fig. 5 shows this conceptualization with a comparison of trajectories between an ideal organization (i.e., represented by the horizontal dotted line with no performance deviation from the $4 billion goal profit level) and that of Organization A. This graphic is identical to Fig. 3 earlier, except that we label the static and dynamic stability explicitly for Organization A. Specifically, we show static stability as the magnitude of performance deviation ($1 billion) associated with the environmental disruption at Time 1 and dynamic stability as the area between the ideal and focal organizations' performance trajectories (i.e., combined magnitude and duration of deviation; $1 billion $\times$ 5 = $5 billion). As in the static case earlier, the horizontal dotted line in Fig. 5 shows how the trajectory of an organization with perfect dynamic fit would remain at a goal level (e.g., in terms of a $4 billion profit level) and experience no performance deviation for all seven time periods. The lesser dynamic stability (i.e., greater dynamic instability) exhibited by Organization A reflects a $5 billion instability penalty, which can be interpreted as an opportunity loss. This gives rise to our second research propositions.

Proposition 2a: A dynamically stable organization will experience less performance deviation from environmental disruption, through time, than a dynamically unstable organization will.

Proposition 2b: The degree of dynamic instability and opportunity loss associated with an organization can be quantified by the magnitude and duration of performance deviation it experiences with respect to the performance of an ideal organization.

TABLE IV
SUMMARY OF KEY DYNAMIC CONCEPTS

Concept	Relation to Extant Theory	Impetus for Change	Construct Measure	Management Role	Exemplars from the Literature	Propositions
Static stability	Relatively good analog to *misfit*; does not pertain to equilibrium; can assess degree of stability; limits performance deviation.	Exogenous shock or disruption.	Magnitude of performance deviation from goal.	Maintain consistent performance with respect to current goals.	Burns & Stalker (1961) [2], Burton et al (2002) [23], Donaldson (2001) [1]	1a, 1b
Dynamic stability	New. Incorporates *time;* limits *instability penalty & opportunity loss*.	Exogenous shock or disruption.	Magnitude and duration of performance deviation from goal; area under Ideal Organization curve.	Recover quickly from exogenous shock or disruption; maintain consistent performance with respect to current goals.	Romanelli & Tushman (1994) [34], Peteraf and Reed (2007) [59], Lengnick-Hall & Beck (2005) [66], Westerman et al (2006) [60], Tushman & O'Reilly (1999) [61], Brown & Eisenhardt (1997) [67], Teece et al (1997) [74], Zajac et al (2000) [24], Burton et al (2006) [41]	2a, 2b
Maneuverability	New. Incorporates *time;* limits *unmaneuverability penalty* & *opportunity loss*; reveals design tradeoff.	Endogenous goal change.	Magnitude and duration of performance deviation from goal; area under Ideal Organization curve.	Move quickly to new goals; *redesign speed*.	Hannan & Freeman (1977) [50], Scott (2003) [54], Pant (1998) [49], Eisenhardt & Martin (2000) [48], Fiss & Zajac (2006) [92], Cardinal et al (2004) [93]	3a, 3b, 4a, 4b, 5a, 5b

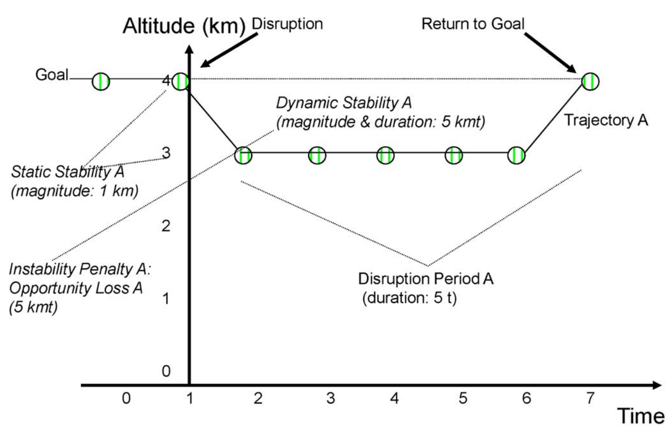

Fig. 4. Airplane A dynamic stability.

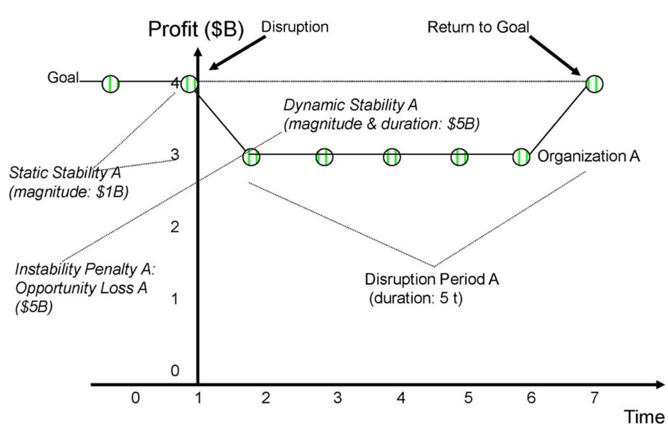

Fig. 5. Organization a dynamic stability.

3) Maneuverability: As with the previous, we annotate Fig. 6 to delineate the dynamic trajectory of Airplane A in terms of altitude over time and to illustrate the concept *maneuverability*. A goal change (e.g., to avoid colliding with another airplane) at Time 1 changes the airplane's desired altitude from 1 km to the 4-km level, and every altitude below the new 4-km goal can be viewed as a performance deviation that persists until the new goal is reached (e.g., six time periods for Airplane A).

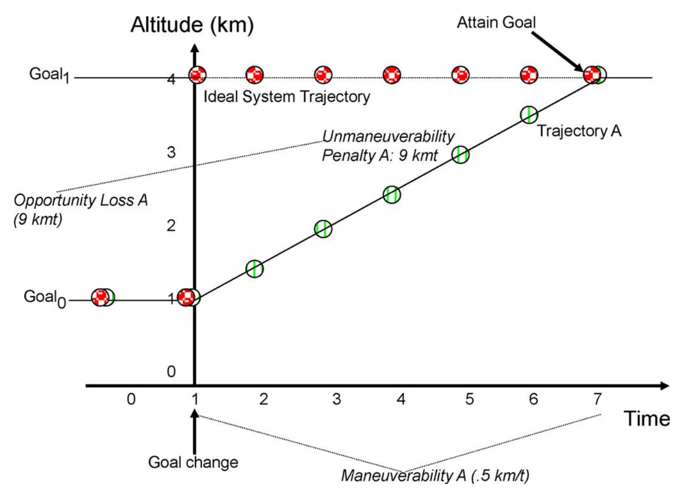

Fig. 6. Airplane A maneuverability.

Maneuverability, in this example, represents the magnitude of altitude change that an airplane can make per unit time: the more maneuverable an airplane is, the greater is the change in altitude it can make in a given amount of time or the less time it requires for a given change in altitude. As shown in the figure, the maneuverability of Airplane A (i.e., 0.5 km/t) reflects its ability to increase altitude by half a kilometer in each time period. Unlike our stability examples earlier where the airplane trajectory is disrupted externally, here we are examining what can be done purposefully to an airplane (e.g., change altitude).

Indeed, an *ideal system* (e.g., perfectly maneuverable airplane) would make the change in altitude immediately and, hence, not spend any time away from the new goal. This is depicted by the ideal-system trajectory delineated in the figure; the ideal system stays at the 1-km goal altitude through Time 1, after which, it increases to the new 4-km level immediately after the goal change. As stated earlier, the combined magnitude and duration of performance deviation provides a basis for comparison with the maneuverability of other airplane designs. For a given altitude change from one goal to another, an airplane that spends less time away from the new goal can be said to reflect greater maneuverability. Likewise, for a given period of

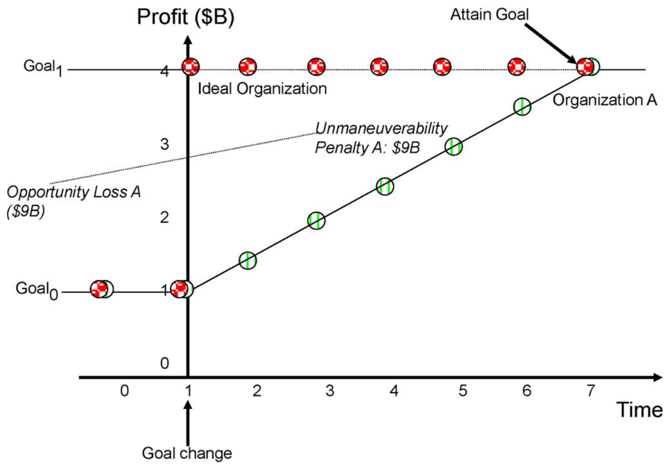

Fig. 7. Organization A maneuverability.

time away from the new goal, an airplane that effects greater altitude change can be said to reflect greater maneuverability.

Further, Airplane A pays something of an unmaneuverability penalty: Since it exhibits lesser maneuverability than the ideal system does, it spends more time away from the goal altitude, and, as previously mentioned, it incurs an opportunity loss during this period away from the goal. When viewed in comparison with the ideal-system trajectory in Fig. 6, opportunity loss can be measured as the area between the ideal and focal system trajectories; the larger the area is, the lesser is the maneuverability and the greater is the opportunity loss, and vice versa. Hence, as shown in the figure, we can relate maneuverability to opportunity loss.

In terms of organizations, consider the maneuverability of Organization A with its trajectory shown in Fig. 7 along with that of the corresponding ideal organization. In this comparison, Organization A requires six time periods to respond to a goal change (e.g., strategy shift) at Time 1. In comparison with the ideal organization trajectory—which reflects perfect maneuverability—we show a $9-billion area between the ideal and focal organizations' performance trajectories. The lesser maneuverability exhibited by Organization A reflects a $9-billion unmaneuverability penalty, which can be interpreted as an opportunity loss. This gives rise to our third research propositions.

Proposition 3a: A maneuverable organization will be able to change more quickly in response to strategy change than an unmaneuverable organization will, thus incurring less opportunity loss.

Proposition 3b: The degree of unmaneuverability penalty and opportunity loss associated with an organization's response to strategy change can be quantified by the magnitude and duration of performance deviation it experiences with respect to the performance of an ideal organization.

4) Stability-Maneuverability Tradeoffs: An important tradeoff in aircraft design exists between stability and maneuverability. The tradeoff is obtained because design aspects that contribute to aircraft stability (e.g., size, front loading of mass, rear concentration of pressure) degrade maneuverability, and vice versa. In terms of organizations, an analogous design tradeoff would imply that highly stable organizations would not be particularly maneuverable, and vice versa. The implication is that, when designing an organization to produce consistent results through environmental disruptions (i.e., emphasizing stability), for instance, management would have to sacrifice some capability for rapid organizational change (i.e., deemphasizing maneuverability). Likewise, when designing an organization to enable rapid change (i.e., emphasizing maneuverability), as a counter instance, management would have to sacrifice some capability for robust performance (i.e., deemphasizing stability). This gives rise to our fourth research propositions.

Proposition 4a: A highly stable organization will be less maneuverable and less able to change quickly in response to strategy change—but will incur lesser instability penalty—than a less stable organization will.

Proposition 4b: A highly maneuverable organization will be less stable and will incur greater instability penalty—but will be more able to change quickly in response to strategy change—than a less maneuverable organization will.

5) Technology: Leveraging the fundamental tradeoff noted earlier, in today's aerodynamics, we note the counterintuitive trend in which modern aircraft are designed intentionally to be inherently unstable: Unstable design enhances maneuverability. The problem is, of course, that such unstable yet maneuverable aircraft are exceptionally difficult to control—indeed beyond the ability of human pilots. It is only through the active assistance of technology, such as computer flight-control systems, and with a human pilot that such aircraft can be flown at all.

In terms of organizations, substantial research addresses the role of information technology in balancing organizational flexibility with control [48], [67], [88] through real-time information, forecasting, marketing, product design, and supply-chain management [56]. Organizational instability through design, combined with analogous "flight-control" management processes and information technology [89], [90], may lead to greater maneuverability and may be essential for highly maneuverable organizations to be controlled at all. This gives rise to our fifth research propositions.

Proposition 5a: A highly maneuverable organization must be designed to be unstable but can be controlled more effectively with management information technologies than maneuverable organizations without such technologies.

Proposition 5b: The comparative unmaneuverability penalty and opportunity loss associated with a highly maneuverable organization's use of management information technologies can be quantified by the magnitude and duration of performance deviation it experiences with respect to the performance of the same organization without such technologies.

C. Extended Conceptual Model

At this point in the discussion, we have sufficient conceptual grist and organizational analogs to outline an extended conceptual model that reflects the research propositions summarized previously. In particular, summarizing from the extended discussion, we identify the magnitude of performance deviation as key to empirical measurement of static stability, the combination of magnitude and time for dynamic stability, and

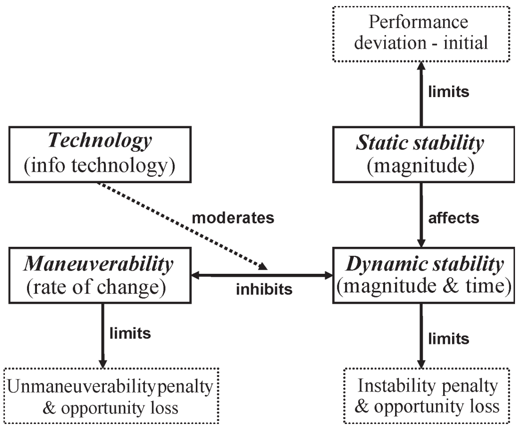

Fig. 8. Extended conceptual model.

the rate of change for maneuverability. Although it does not generate a straightforward approach to measurement, we also identify information technology as central to the technology concept, and we include both instability and unmaneuverability penalties—and their corresponding opportunity losses—in Fig. 8 as well.

This figure—and the extended conceptual model—is clearly very similar to its Fig. 1 counterpart—and the basic conceptual model. However, several aspects of our theoretical extension and extended conceptual model are evident. For instance, in the extended conceptual model, we include operationalized constructs that suggest an approach to empirical measurement of key concepts (e.g., measure *static stability* through magnitude of performance deviation). We further identify penalties (e.g., instability penalty) and corresponding opportunity losses in terms of dynamic stability and maneuverability, and we include an explicit focus on *information* technology to enhance management control over organizations. This extended conceptual model, particularly with its operationalized constructs, outlines a theory-based framework for empirical testing.

IV. Extending Extant Theory

Here, we discuss our consistency with and extension to extant theory. We first use a succinct table to summarize the key dynamic concepts developed earlier. We then connect our research propositions to some exemplars from the literature to address the consistency of our conceptualization with extant theory and to summarize our principal extensions thereto.

A. Key Dynamic Concepts

Table IV summarizes the key dynamic concepts and helps us to enfold our theoretical comparison and extension into the extant literature. Each of the three key dynamic concepts is listed in the first column with its relation to extant theory noted in the second. For instance, as noted earlier, *static stability* and *misfit* appear to be relatively good analogs, as static stability is consistent with long-standing and current conceptualizations of fit; however, static stability does not pertain to static equilibrium, and this concept provides us with an ability to assess the *degree of stability* in terms of magnitude of performance deviation.

The third column summarizes the impetus for change and reflects static stability in terms of exogenous shocks or disruptions. The column for construct measure summarizes how each concept could be quantified, and its counterpart in Column 5 highlights the corresponding management role. For instance with static stability, the concept could be measured as the magnitude of performance deviation from the goal, and the corresponding management role is to maintain consistent performance with respect to current goals. In Column 6, a few exemplars from the literature are listed for each concept, and the entries in Column 7 link the aforementioned propositions to each concept.

B. Consistency With Extant Theory

Our conceptualization is very consistent with extant theory. First, the central premises of Contingency Theory (particularly, that no single approach to organizing is best in all circumstances; that poor organizational fit degrades performance; and that many diverse organizational structures, forms, configurations and other groupings have been theorized to enhance fit across an array of contingency factors) remain consistent with our dynamic perspective [2]; nothing in our conceptualization would offer cause to question such central theoretical premises.

Second, *organizational fit* remains consistent with our perspective, particularly in terms of *static stability*, which exhibits several aspects of consistency with *misfit* [23]. Presumably, based on our conceptualization of static stability, the misfit concept could be viewed more in terms of *dynamic reaction* to environmental disruption than a departure from static equilibrium, and the *degree of misfit* could be measured in terms of magnitude of performance deviation. These represent relatively minor refinements. Hence, our theoretical work falls well within the rubric of Contingency Theory. Donaldson [1] states the fit concept succinctly: a match between the organization structure and the environment for positive performance. As summarized in the Introduction, there is a very large literature which uses this basic idea. Proposition 1 points to static stability and could be linked to organizational misfit.

In terms of *dynamic stability*, our conceptualization reveals both similarities and differences with other theoretical contributions that have been made over the past several decades. Consistent with punctuated equilibrium [34], for instance, our dynamic perspective considers that organizational transformations may be required following rapid discontinuous environmental change. As equilibria are punctuated with increasing frequency [59], as another instance, or as dynamic multicontingency contexts move toward continuous unpredictable change [66], management finds it increasingly difficult to obtain the best dynamic fit across time periods [60]. Although our conceptualization of dynamic stability draws upon a different more dynamic metaphor than *fit*—and can be operationalized with our area measure of performance deviation (and, hence, opportunity loss) across time—presumably, it could be viewed in terms of *dynamic* misfit across time.

Further, such conceptualization provides an approach to assessing the relative merits of alternate techniques to achieve organizational ambidexterity [61] through concepts and measures that incorporate time explicitly and directly. Characterizing organizational designs in terms of balances between order and flexibility [67] or dynamic capabilities [74] highlights the explicit temporal focus of *dynamic stability*, as designs reflecting different degrees of balance or capabilities will reflect different dynamic stability levels with the corresponding dynamic instability penalties and opportunity losses.

Additionally, in terms of fitness landscapes [20], [42], [63]–[65] although our conceptualization draws upon a different more dynamic metaphor than *landscape*, several correspondences can be seen. For instance, our static and dynamic stability concepts, which characterize an organization's resistance to and recovery from performance deviations resulting from exogenous shocks, correspond relatively well with the kinds of smooth fitness landscapes that reflect robust organizational designs; performance is relatively insensitive to environmental shifts. Indeed, our instability-penalty and opportunity-loss concepts could be viewed in terms of how rugged a fitness landscape appears, and our operationalization (i.e., area beneath the ideal-organization trajectory) may provide a means for developing an empirical measure of "ruggedness."

Likewise, our maneuverability concept, which characterizes an organization's ability to change through redesign, exhibits some correspondence to an organization's ability to make long jumps across fitness peaks. Indeed, as mentioned earlier, our unmaneuverability-penalty and opportunity-loss concepts could be viewed in terms of how capable of change an organization may be, and our operationalization (i.e., area beneath the ideal organization trajectory) may provide a means for developing an empirical measure of such capability.

Finally, answering calls from the literature for more dynamic perspective [24], *time* emerges as a central concept of dynamic stability, which we address in an inherently dynamic manner as opposed to sequences of static changes [41]. Proposition 2 points directly to dynamic stability and its link to dynamic-instability penalties and opportunity losses.

In terms of *maneuverability*, our conceptualization reveals both similarities and differences with other theoretical contributions that have been made over the past several decades also. Consistent with population ecology [50], for instance, our dynamic perspective considers time explicitly. However, in supporting organizational design as a rational undertaking [54], our conceptualization is teleological in nature [53], identifying a critical role for management to maneuver organizations through purposeful design changes [2], [7], [91]. Likewise, as another instance, organizational maneuverability is consistent with the idea that management might benefit from moving their organizations purposefully out of fit at some points in time [41], [49], [60], either in reaction to or in anticipation of different times and contingencies. Indeed, our concept *maneuverability* addresses explicitly the capability of an organization to undergo design changes at various rates.

Further, we understand how conditions of misfit can be obtained endogenously as well as result from exogenous disruptions. Deliberate management-induced disruptions—such as through strategic choice [35]–[37], [41], cultural change [38], and organizational change [39], [40]—can cause dynamic-performance change (misfit) and opportunity loss as great as those stemming from environmental shifts. *Maneuverability* characterizes the ability of management to change the organization deliberately over time (e.g., seeking to seize emerging strategic opportunities across time periods).

Likewise, the kinds of multiple repertoires and scripts called for to maneuver organizations through very dynamic high-velocity markets [48] are entirely consistent with organizational maneuverability, as is the kind of balancing [92] or rebalancing [93] required to restore fit when an organization loses its balance. Moreover, our conceptualization of *maneuverability* includes an approach to operationalization through an area measure related to unmaneuverability penalty and opportunity loss. Such measure could apply well to assess the degree of balance and rebalance articulated through work along these lines. Proposition 3 points directly to maneuverability and its link to unmaneuverability penalty and opportunity loss.

In terms of *maneuverability* also, we go further by articulating a fundamental design tradeoff between stability and maneuverability. With some parallel to the ambidextrous organization [61], we view organizations as integrated designs, with no theoretical restriction to single-mode operation. However, our fundamental design tradeoff between stability and maneuverability would assert some limits on the kinds of ambidexterity any given organization would be capable of. Such design limits would apply to resilience capacity [66], edge organizations [87], [94], and dynamic capabilities [48], [74] as well. Indeed, designing an organization for maneuverability—as opposed to stability—would represent an explicit design goal with constrained alternatives. Proposition 4 points directly to maneuverability and its tradeoff with stability.

Additionally, given that maneuverability requires tradeoff with stability in our conceptualization, the kinds of organizational semistructures [67]—which seek to balance order with chaos and to keep organizational processes from flying out of control—appear to support such tradeoff between stability and maneuverability. Perhaps we can understand this tradeoff better by examining product development, alliancing, decision making, and other organizational processes [48] to understand the role of flight-control management information technology (e.g., leveraging real-time information systems, supply-chain management systems, forecasting models) as means to enhance the control of maneuverable-but-unstable organizations. Proposition 5 points directly to how management information technology offers promise to enhance stability of highly maneuverable organizations.

C. Extensions to Extant Theory

Our conceptualization extends extant theory as well. The conceptual model proposed earlier articulates a number of concepts (e.g., *static stability, dynamic stability, maneuverability*) and interrelationships (e.g., respective effects on performance deviation, instability penalty, unmaneuverability penalty and opportunity loss; stability–maneuverability tradeoffs; and management information-technology moderation) that extend beyond the body of current Contingency Theory. They also provide a basis for examining the dynamics of contingent organizational design in a different light and through a different inherently dynamic metaphor—one that comes with concise and coherent dynamical language and integrated system of concepts, definitions, and interrelationships from Aerodynamics—and reveals new insights into organizational design. Further, the associated propositions provide the basis for empirical examination, particularly as our measures for *static stability, dynamic stability*, and *maneuverability* (and the associated penalty and opportunity losses) offer a preliminary approach to operationalizing constructs for examining testable hypotheses.

Returning again to Table IV, in terms of dynamic stability, this concept is new to organization and management sciences, as it incorporates *time* explicitly and limits *instability penalty* and *opportunity loss*. As with static stability, the impetus for change stems from exogenous shocks or disruptions, but distinct from its static counterpart, the construct measure for dynamic stability includes both magnitude and duration of performance deviation from goal; one can calculate the area under the curve for an ideal-organization trajectory. Also, somewhat distinct from static stability, the focus of management is to recover quickly from exogenous shocks or disruptions, but both concepts share maintaining consistent performance with respect to current goals as a key management role.

In terms of maneuverability, this concept is new also, as it incorporates *time* explicitly and limits *unmaneuverability penalty* and *opportunity loss*. Maneuverability also makes explicit the design tradeoff with stability: Maneuverability and stability are mutually inhibiting. Maneuverability differs from both stability concepts, as its impetus for change stems from endogenous goal change. The construct measure for maneuverability is very similar to that for dynamic stability, however, as it includes both magnitude and duration of performance deviation from goal, and one can calculate the area under the curve for an ideal-organization trajectory; the key difference is that, maneuverability pertains to performance deviations resulting from endogenous goal changes, whereas dynamic stability pertains to exogenous shocks and disruptions. Also, distinct from both static and dynamic stability, the focus of management is to move quickly to new goals; such focus, however, is comparable with much extant theory, as it amounts to the speed at which management can redesign and change an organization to reach new goals.

Further, our conceptualization of *static* and *dynamic stability* goes well beyond the static equilibrium-focused theoretical and analytical scope of *fit/misfit* as a concept, and our conceptualization of *maneuverability* links organizational redesign with opportunity loss in an explicitly dynamic context. With such extension, we can look beyond whether an organization is in comparably good fit at any point in time: by understanding and visualizing the design and performance trajectory through time; by examining contingent organizational design as an inherently dynamic activity; by recognizing *misfit* as the most likely condition of most organizations; by incorporating *time* as a central concept; and by interrelating organizational design, stability, maneuverability, and opportunity loss both conceptually and in terms of measurable constructs. This novel capability helps one to answer calls in the literature [23], [24] to address the inherent dynamics associated with Contingency Theory and organizational design.

V. Conclusion

Fit represents a central concept for organizational design, but extant research maintains a static focus on fit, a focus that is incommensurate with the fundamentally dynamic nature of organizations and their environments. Most key organizational environments are inherently dynamic; hence, the corresponding organizational designs required for fit are necessarily dynamic too. The problem is, the dynamics of fit are not addressed well by extant theory in organization and management sciences. Alternatively, organizations can be viewed as systems of purposeful design, and designing organizations to maintain fit and respond to dynamic environments over time may be informed well by theory and practice in engineering fields where such design is well established.

In this paper, we abstract to the level of airplane design, and we utilize the dynamical language and integrated system of concepts, definitions, and interrelationships from the engineering field Aerodynamics to extend organization and management science and address the problem of organizational design in a dynamic context. We begin with a focused summary of the literature regarding the nature of organizational fitness. We then outline a conceptual model adapted to organizational design from Aerodynamics, and we summarize the key aerodynamics concepts *stability* and *maneuverability* to inform our conceptualization in terms of both airplane and organization design. This work enables us to articulate a set of propositions and measures that form a basis for empirical testing. This work also reveals important, dynamic organizational design tradeoffs and implications, and it shows how such conceptualization can elucidate new insights via comparison with and extension to extant theory—in engineering as well as organization and management sciences.

Our dynamic conceptualization has resulted in a conceptual model and five research propositions that both conform to and extend extant theory. For instance, we relate *static stability* by analogy to *misfit* and operationalize the corresponding construct as the magnitude of performance deviation. Likewise, through *dynamic stability*, we incorporate *time* explicitly, conceptualize *instability penalty* and *opportunity loss*, and operationalize the corresponding construct as the combined magnitude and duration (i.e., an area measure) of performance deviation. Moreover, *maneuverability* incorporates *time* explicitly also and relates directly to conceptualization of *unmaneuverability penalty* and *opportunity loss*, with operationalization of the corresponding construct through a similar area measure. The model and its propositions point to new organizational design considerations, tradeoffs, and role of management information technology to provide stability and control to highly maneuverable organizations.

As with any study, there are limits to how much progress can be articulated in a single paper such as this, but the conceptualization presented here offers potential to open up a whole new avenue of future research along the lines of this investigation. In particular, all of the concepts and relationships presented in our conceptual model call for further elaboration and refinement, and as noted earlier, they merit empirical testing as well. As another limitation, we draw upon only a limited set of literature that could be used to conceptualize dynamic fit. Addressing organizations as "living systems" [95] for instance, may offer potential to expand the insights generated through our airplane analogy and Aerospace-engineering adaptation to the domain of organizational design. Likewise, as noted previously, decision making is fundamental to organizational management and design; hence, the extensive decision theory and decision support literatures [96] could shed additional metaphorical light on the dynamic-fit phenomenon as well. We leave such expansion through other literatures to future research.

Additionally, the conceptual model also lends itself to computational modeling and analysis (e.g., via simulation), and the research propositions may generate a campaign of computational, laboratory, and even field experimentation, as researchers strive to understand the extent and limits of organizational stability, maneuverability, and opportunity loss associated with organizational design in the context of dynamic contingencies. To summarize, the contribution of this paper is clearly limited, but we hope that it will be noteworthy and constructive and that it will generate new streams of research in organization and management theory. Further, as engineers venture increasingly into the organization and management domain, it will become increasingly important to understand, appreciate, and account for such systemic contrasts. The organization and management sciences literature provides abundant insight toward this end.

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