Measuring Motivational patterns: a formal approach of conservation of resources theory

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Abstract: The present research develops a formal mathematical model to measure individual motivation at work. Its mathematical specifications correspond to a formal translation of Conservation of Resources (COR) theory core assumptions. It explores how such COR constructs as resource caravan and resource passageway determine patterns of motivational processes. The model is applied to a sample of working professionals $(n = 8)$ from different occupations. Data is obtained from a 5-item Lickert-scale questionnaire based on the COR-Evaluation (COR-E) instrument developed by Hobfoll et al. (1992). Results are presented in the form of eight different Tables that correspond to eight different resource caravans. They unveil how individual motivational processes vary by the extent to which resources interact with an underlying drive for preservation. The role of context is also confirmed as a resource passageway. With regard to methodology, this research emphasizes how measurement based on mathematical modeling can be an alternative to standard data-analytic statistics. At a theory level, it enriches both COR-based literature and theory of workplace motivation. Practically, it provides an analytical instrument that details information on those processes that shape individual motivational profiles in organizations.

Key Words: Motivation, Mathematical modeling, Resource caravans, Resource passageways, Person-specific, Human resource management

INTRODUCTION

In Industrial/Organizational (I/O) psychology, motivation stands as a fundamental construct of multiple applications, such as recruitment, training, reward management, innovation, and wellbeing (Grant & Shin, 2012). Motivation practice and theorizing, however, remain determined by the way they are assessed. For instance, a review spanning the 20$^{\text{th}}$ century listed no less than 13797 studies on motive measurement (Mayer, Faber & Su, 2007). Motivation core mechanisms, however, lay outside direct observation, which makes it a latent construct, accessible only through its manifestations (e.g., direction, magnitude and persistence), its causes, and its consequences (Pritchard, 2008). While instrument designs clearly relate to the nature of *what* is being measured, i.e. outcome or process (Touré-Tillery & Fishbach, 2014), measurement of work motivation has thus been following two distinct paths. A first, most conventional, is to develop instruments validated by psychometric manipulations. This consists in selecting a number of items as partial indices of the focal construct of motivation. Commonalities across items provide justification for combining into a single scale (see for instance: Campion, 1988; Bernard et al., 2008; Lawler & Hall, 1970; Gagné et al., 2015; Tremblay et al., 2009). A second, considers motivation from the perspective of its internal processes, as it focuses on patterns of interactions between variables. Hence, measurement corresponds to formulas from content-free theorizing rather than from standardized and generally applicable scales (Hackman & Oldham, 1976; Kotliarov, 2008; Vroom, 1964).

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Conservation of Resources (COR) theory (Hobfoll, 1988, 1989, 2001; Hobfoll, Halbesleben, Neveu, & Westman, 2018) corresponds to a process-based theory that focuses on motivational dynamics. Over the past 40 years, it has provided a relevant framework to understand motivational processes across work settings and occupational behaviors (Hu et al., 2023; Hobfoll, Neveu, & Westman, 2023). To date, however, no corresponding measurement has emerged that unifies the various COR assumptions on resource interactive and preservation processes. For this purpose, we argue that a translation of COR verbal into formal mathematical formulation can be advantageous on several grounds.

First, a formal mathematical model establishes a tight, logical link between theoretical assumptions and testable parameters. It thus acts as "a consistency check for the theory" (Mershon & Shvetsova, 2019, p. 185). Applied to COR theory, this can help strengthen the theoretical chain between the resource construct, and issues related to resource interactions and dynamic patterns (Halbesleben et al., 2014). Second, a formal model brings clarity and transparency, as it can easily be replicated. A COR-based algorithm can bring the advantages of not only repeated use, but also of refinement by incorporating possible additional motivational resources/parameters to the baseline model. Third, and closely related, model replication facilitates knowledge accumulation. Methodological flexibility of formal modeling can help integrate through logical links additional COR constructs on resource interactions and context within the core argument of resource preservation. Finally, and for its generalizability, a formal math-based model can easily be used for practical purposes. It can provide a ready-made formulation for designing individual COR-based motivational profiles. Furthermore, due to mathematical accuracy and axiomatic transparency, the model can be replicated with results easily compared with previous data obtained through this same approach.

The aim of this research is to measure motivational processes within a COR-based perspective. These processes are at the same time simultaneous and divergent, for the need for developing valued resources collides with the opposing drive for resource preservation. To capture these competing forces, we develop a formal mathematical model that explains interactions between motivational resources and the dominant drive for resource preservation. Formal theory-driven models offer innovative alternatives to data-based approaches (Guastello, 2001; Guastello et al., 2014; Townsend, 2008; Sprott, 2005). In our case, we present a formal translation of the verbally expressed COR assumptions. Here, measurement relates to *explanatory* modeling, as it seeks to understand individual mechanisms that engineer motivation. This is different from probability-based measurement that, through hypotheses-generating computational scenarios and simulations (Guest & Martin, 2021; Shmueli, 2010), seeks to predict anticipated behaviors. In I/O literature, computational modeling, a Bayesian-based method, is one such example (Vancouver & Weinhardt, 2012; Weinhardt & Vancouver, 2012).

Our study starts by introducing a general framework that discusses issues of motivational dynamics and related COR theory assumptions. From this, it develops a formal math-based model that specifies patterns of interactions between drives for preservation, motivational resources, and the environment. Then comes an empirical test conducted among a sample of working professionals. This important step is to verify the applied behavior of the model, and the extent to which it can evaluate the nature of motivational differences within, and between, individuals. Finally, theoretical and applied arguments are presented that enrich theory and measurement of workplace motivation.

MOTIVATIONAL DYNAMICS AND COR THEORY

Commonly, the literature proposes scales for measuring motivation motives. Motivational dynamics scales, however, evaluate the extent to which selected sources of motives can determine and regulate motivation (Mayer et al. 2007). Fundamentally, motivational scales focus on how self-determined motives integrate within a person's mental life, control and condition motivational processes. An example of this approach is the General Causality Orientation Scale (Deci & Ryan, 1985), that locates the *why* of behavior in underlying needs for competence, autonomy and relatedness. Other such measures identify the perceived motivational locus with mastery and performance orientations (Seifriz, Duda, & Chi, 1992), intrinsic and extrinsic motivational categories (Amabile, Hennessey, & Tighe, 1994), or with instrumental motivation and goal internalization (Barbuto & Scholl, 1998).

COR theory considers motivational dynamics. It builds on the primacy of a drive for conservation over gain, a self-determined preservation drive, as a locus of motivation. Self-determination theory, for instance, limits motivation to the satisfaction of three essential, and universal, needs (e. g., autonomy, relatedness and competence). For COR theory, however, it is the intensity of the preservation drive that grants motivational value to specific needs. These needs are referred as resources, and defined as "anything perceived by the individual to help attain his or her goals" (Halbesleben et al., 2014, p. 1338). They fall into four categories, e. g. personal (for instance, competence and autonomy), social (for instance, relatedness), tangible (a uniform, a company car, . . .), and energetic (such resources which, as time or training, are valued for being instrumental to preserve, or develop, other types of resources). Hence, from a COR perspective, dynamics correspond to those losses or gain spirals of motivational resources, given that resource loss greatly outweighs resource gains and moves with momentum of greater speed and force. This limits resilience and gain cycles (Hobfoll, Stevens, & Zalta, 2015).

Unlike other approaches, however, the theory does not propose an original measurement scale. It only identifies 74 resources whose dynamics it evaluates in terms of gain, threat, and perceived threat of loss overtime (Hobfoll, Lilly, & Jackson, 1992). Most important, this list, the Conservation of Resources-Evaluation (COR-E), does not purport to be exhaustive but rather comprehensive since it corresponds to underlying factors of social, personal, tangible, and energetic resources. Hence, the few existing COR-E based studies have varied in their use of the original items, from integral application (Wells, Hobfoll, & Lavin, 1999), to partial (Ennis, Hobfoll, & Shröder, 1993; Goldfarb & Ben-Zur, 2017), or customized (Hobfoll, Lilly & Jackson, 1992).

Consequently, three main challenges can be formulated for measuring motivation within a COR perspective. First, measurement leaves open the issue of resource malleability and influenceability (Sonnentag & Meier, 2024). Resources can effectively change while in contact with each other. Hence, a gain/loss cycle cannot be considered a homogeneous whole, as one resource can "contaminate" (*op. cit.*, p. 6) another over a complex process of interactions. Second, most results evaluate between-person differences, while much remains to be done on a parallel process at the within-person level (*ibid*). This perspective would help gain further understanding of the "gain paradox principle", where resource value gains salience in the context of resource loss (Hobfoll et al., 2018). Consequently, a third challenge is methodological, as the literature commonly limits to measuring trajectories of upward or downward resource spiraling from a variety of data-analytic statistics, including cross-lagged panel, random-intercept cross-panel, and latent change score models (see for a critical review Sonnentag & Meier, 2024).

We argue that such challenges can be addressed to the extent that research does not restrict to only one facet of the theory, i.e. the study of motivation as an aggregate summation of resources spiraling toward depletion or development (Halbesleben et al., 2014). A second, and complementary, aspect of the theory can be further investigated that considers the state of internal mechanisms. Here, the focus is on those interactions between resources that shape motivation viewed as "a constellation of associated parts" (Hobfoll et al., 2020, p. 78). The present research explores this later approach, where patterns of interactions between resources are essential to the understanding of motivational dynamics, just as the plasticity of synaptic connections gives shape to neural network activity.

A COR-BASED FRAMEWORK OF RESOURCE PATTERNS

To account for resource dynamics, Hobfoll (2011) has formulated an additional construct to his theory: the resource caravan. For the theory, "motivational resources do not exist individually but travel in packs, or caravans, for both individuals and organizations" (Hobfoll et al., 2018, p. 106). A resource caravan is an aggregate of interwoven resources that cannot be comprehended piecemeal. In other terms, the COR perspective departs from the more commonly accepted structuralist approach of motivation processes that builds upon the identification of separate psychological elements. Fundamentally, a caravan should be considered a traveling package of interrelated resources.

Yet, while the term "caravan" conveys the idea of movement, the theory also puts the focus on intrinsic features of the convoy itself. Beyond the role of specific resources, it highlights interactions as a main focus of interest. A resource caravan is a Gestalt, an organism whose form depends on the necessities of its internal structure (Goldstein, 1995/1934). The resource caravan is thus expected to shape differently within an antagonistic framework between drives for preservation and development. Preservation we already presented, as an all-powerful, ingrained bias of human psychology. Yet, the caravaning process is also shaped by a concurrent challenge of a need for resource development. This growth motive has been related to an evolutionary biogenic drive (Nissen, 1954) of stimulating exploration (Berlyne, 1966; Bernard et al., 2005; Kidd & Hayden, 2015), and curiosity (Kubovy, 1999).

At this point, a main challenge is thus to translate such a theoretical agenda into a model for empirical measurement. Specifically, a framework that integrates those tensions between a predominant drive for preservation and its antagonistic drive for development, within the unique construct of resource caravan.

MODELING THE PATTERN OF RESOURCE CARAVAN

As presented above, the aim of the present research is to provide a measure of motivation using a formal translation of the verbally-expressed COR theory. This represents an alternative to more common approaches, where modeling emerges from an inductive process of statistical data analyses. For this, we develop a mathematical formulation directly derived (deduced) from COR fundamental precepts.

Resources and the resource caravan

COR theory conditions resource development to the antagonistic role of resource preservation. Formally stated, U represents the resource caravan, and c the preservation drive. While c corresponds to a single parameter of varying intensity, U refers to a system of interdependence between components. Specifically, U is a process animated by interactions between independent variables, i.e. the resources: "The resource caravans concept posits that personal, social, and material resources are created developmentally and that they travel in "packs" or caravans, not singly as they are typically presented in the literature" (Hobfoll, 2012, p. 229).

As previously discussed, the elementary element of motivational caravans is the individual resource. COR-based principles state, however, that this elementary particle of a process is defined by its perceived value. We suggest this value is the product of two interactive terms. First the absolute attractiveness, or valence, of a resource. Second, the perceived accessibility of this resource. Also termed resource signal, the latter refers to the extent to which an individual perceives the resource to be available, and therefore worth pursuing (Halbesleben et al., 2014). For example, research in organizational contexts has identified the importance of resource signaling with regard to trust and occupational justice (Campbell, Oerry, Maertz, Allen, & Griffeth, 2013; Neveu & Kakavand, 2019). We thus propose the R value of a resource to be expressed as $R = r_1 \times r_2$, where the total value of a resource is a product of r_1 (personal value of the resource) by r_2 (perceived access to the valued resource).

Once defined, a given resource R is replaced into the dynamic context of a caravan. Following the theory, resource dynamics is a function of a drive for preservation (c). The c value corresponds to the extent to which individuals hold to a valued resource. The motivational value of a given resource, we name u, can thus be modeled as followed:

$$u(c) = \frac{R}{c}. \tag{1}$$

For instance, a caravan, composed of three resources, corresponds to the following. Formally:

$$u_1(c)u_2(c)u_3(c), \tag{2}$$

where u_1, u_2, and u_3 represent various resources, and c, for each value point relating to a specific value of c, the resource preservation motive.

Should we now generalize, each resource (u_j) associates to a drive for preservation (c_j). Therefore, preservation of the whole resource caravan (U) can be written as $c = (c_1, \ldots, c_N)$, with each function $u_1, \ldots, u_N$ changing its value so that $u_1(c_1) \ldots u_N(c_N)$. Therefore, the resource caravan, we now name $U(c)$, expresses as follow:

$$U(c) = \prod_{j=1}^{N} u_j(c_j). \tag{3}$$

Extending our base model (1) to a number of resources, we thus obtain that

$$u_j(c_j) = \frac{R_j}{c_j},\ \forall j \in \{1, \ldots, N\}. \tag{4}$$

Therefore our final model is:

$$U(c) = \frac{R_1 \times \ldots \times R_N}{c_1 \times \ldots \times c_N}. \tag{5}$$

Formulas (3) and (5) correspond to the state of interactions between motivational resources in relation to the counter influence of the preservation motive. Defined and modeled as such, the resource caravan equates to the individual core motivational profile. This profile is not a mechanic addition of internal resources. It is an active evolving process based on interactions between variations of each individual resources.

To conclude, our modeling intends to show how a resource caravan exists through interactions between resources of non-fixed values that compete between each other. For instance, self-esteem can *conflict* with coworker support, whereas conscientiousness and hardiness may *synergize.* Formally, these interactions are deemed functionally nonlinear as they impact differentially each system component. Whereas "longitudinal nonlinearity" considers change from an incremental time-perspective, "functional nonlinearity" focuses on those internal processes that shape a structure viewed as a complex system (Brown, 1995). From engineering (Pore, Thorat, & Nema, 2021) to biology (Kolston, 2000) and physiology (Willy, Neugebauer, & Gergross, 2003), functional nonlinearity applies to models that investigate multiple interactions between individual components, whose output is non-proportional to the input, and that do not stem from simple causality. In the present study, this means that patterns of a resource caravan (a complex system) proceed from a transformational process, where interactions are not considered on the basis of individual resources with predefined binary characteristics (positive or negative). This is an essential point as it should be stressed that COR theory is not so much about fixed properties as it is about changing values.

RESOURCE CARAVANS THROUGH PASSAGEWAYS

So far, we have been focusing on internal dynamics of resources caravans. The resource caravan concept, however, does not limit to internal dynamics between motivational resources. As an ecological approach to human behavior, COR theory integrates context as a companion of the caravan process. Context is viewed from the perspective of providing *resource passageways. Resource passageways* are contingent processes defined as "ecological conditions that either foster and nurture or limit and block resource creation and sustenance" (Hobfoll et al., 2018, p. 106). A resource passageway signifies that a desirable environment forms part of the motivational process to the point of turning itself into a motivational resource. Conversely, when context calls for attention as potentially undesirable, and thus poses a threat to preserving valued resources, it becomes a "non-passageway", i.e. a *demand*, (Hobfoll, 1988).

In the following, we build on COR-based literature to enrich our model of resource caravans by including the role of *resource passageways.* In so doing, we distinguish between objective and subjective environments, since this distinction induces two different models.

Environments as objective passageways

One type of environment associates to objective realities. By objective, we refer to the etymological sense of something that is "thrown in front" (*ob-jactere*). It is external to the individual, which means that it imposes challenges to adaptation, and possibly survival. The literature has thus investigated exotic work environments (also referred as ICE, for Isolated, Confined, and Extreme), where tangible hardship can bear on individual physiology and traumatic vulnerability (Harrison & Connors, 1984; Golden, Chang, & Kozlowski, 2017). But environment objectivity may not limit to extreme weather conditions, natural catastrophes, or viral pandemics. It can also refer to such situations as workplace violence, layoffs, or economic recessions.

Within the framework of statistical data analyses, COR-based research has investigated the impact of adverse contexts on resource depletion and subsequent psychological dysphoria. These include, among others, natural disasters (Zwiebach, Rodhes, & Roemer, 2010), terrorism (Zeidner, Ben-Zhur, & Reshef-Weil, 2011), pandemics (Shelef et al., 2022), and individual aggressions (Perez & Johnson, 2008). Such objective contexts represent passageways, or demands, that impact resource caravan development.

Considered from our formal deductive approach, a passageway thus corresponds to a parameter to be added to the resource caravan model. This we express as follow:

$$U(c) = \prod_{j=1}^{N} u_j(c_j) \times P(c) = u_1(c_1) \dots u_N(c_N) P(c_1, \dots, c_N), \tag{6}$$

where P corresponds to the resource passageway. Explicitly formulated:

$$U(c) = \frac{R_1 \times \dots \times R_N}{c_1 \times \dots \times c_N} P(c_1, \dots, c_N). \tag{7}$$

Environments as subjective passageways

In the realm of human and social sciences, however, environments are also said to be subjective. By subjective, we mean an environment not defined by neutral states or characteristics, but by the function it assumes (James, 1905). Its reality refers to the mental (re)construction of experienced life-events framed by values and social representations. It should be noted, however, that a distinction between objective and subjective environments may not be as sharp as expected. At times, repeated exposure to objective contexts can be internalized as to foster a sense of experienced familiarity and manageability. Accounts of daily life in war-torn environments provide examples of such situations (Harris & Brown, 2020). From a COR-based perspective, it can thus be argued that contexts are function of a perceived degree of control and manageability, challenging, or distressing, depending on internal needs and value systems.

Modeling of resources caravans in relation to subjective passageways postulates that there is no separation between actors and context. Therefore, relationships between individuals and their environment are not of the transactional Person-Environment fitting type. Instead, modeling assumes that links between context and psychological resources are reflexive. By reflexive, we mean that individuals confront situations that depend on their own decisions. Empirically, this mutual relationship has been investigated in various fields of social sciences, including environmental sociology (Boström, Lidskog, & Uggla, 2017), financial transactions (Soros, 1988) and economics (Beinhocker, 2013). Reflexivity challenges the objective neutrality of an environment deemed conditioned by the bias of individual memory of past experiences. Therefore, and while individuals are dependent on their social environment, context is also influenced by the perception of its own participants. Contrary to equilibrium-based models of resource investments (Peterson et al., 2011) a reflexive approach is non-linear and non-directional.

Consistent with our formal perspective, we propose to modify the resources caravan model so as to fit its reflexive relationship with the environment. As such, and distinct from an objective passageway model, context is treated as a function rather than as a parameter. The following two models correspond to the complex, and simultaneous, relationships between resource caravans and resource passageways. Each offer a complementary view of the motivation caravan.

A first model (8) corresponds to the resource caravan as it is impacted by resource passageways:

$$U(c) - \frac{R_1 \times \ldots \times R_N}{c_1 \times \ldots \times c_N} P(c) = 0. \tag{8}$$

This model specifies that any change value of the resource passageway affects that total value of the resource caravan. The resource passageway P acts as a sensory stimulus.

A second model (9), corresponds to another facet of the relationship between the resource caravan and the resource passageway:

$$U_0(c) - 3\frac{R_1 \times \ldots \times R_N}{c_1 \times \ldots \times c_N} = 0. \tag{9}$$

Specifically, this model illustrates how the total value of a resource caravan incorporates the resource passageway. It reflects how an individual does not face the environment from a psychological blank state. Rather, (9) formulates the extent to which an ingrained memory of dealing with P has made context part of the resource caravan. The model is also to be considered a control model of the previous one (8). Technically, the perceived value of P varies. A value above a given mid-point relates to a "positive" passageway, while below it corresponds to a perceived demand ("negative" passageway).

FIELD EXPERIMENT

Since our focus of interest is motivation in relation to social relationships, a model for subjective environments appears relevant to frame a measurement test. Practically, questionnaires have been distributed to a sample of working professionals $(n = 8)$ from different work environments. In the case of the present study, and contrary to data analytic statistical modeling and measurement, sample size is not an issue. The model is explicative, and measurement is to evaluate the variety of motivational patterns within and between individuals. Each pattern, or resource caravan, is personal and as such not replicable.

Our sample was selected to illustrate variations between work settings, and to highlight contrasting roles of resource passageways. Each individual corresponds to a unique resource caravan. Put differently, a resource caravan corresponds to an individual motivation profile.

Resource value was gauged using methodology from Hobfoll's COR-E instrument (Hobfoll & Lilly, 1993; Hobfoll, Lilly, & Jackson, 1992). All items graded on a five-point Lickert scale as answers to two questions: "*How important are the following resources to me?*", and "*To what extent do I have access to these resources?*". Preservation of resources was assessed in relation to the following question: "*How strongly do you feel to not lose these resources?*". All items used referred to one type of psychological resources: "*To have time for doing my work*" (energy resource), "*To have access to the necessary tools/means for work*" (tangible resources), "*To get acknowledgement of my accomplishments" (personal resource), and "To get support from co-workers*" (social/interpersonal resource). Finally, resource passageways measurement corresponded to a single five-point Lickert scale, with a neutral value set at answer level 3: "*How would you rate your working climate?*"

Drawing from our modeling, the following Tables summarize results for each individual as a particular caravan. From here, we apply the mathematical formulas with the numerical values obtained in the answers to the various questionnaires. In the following Tables, the final results correspond to the calculation of the last two lines (formulas (7) and (9)). The other lines correspond to intermediate results.

Caravan 1 corresponds to a female junior information system specialist, aged 28, in a multinational construction group.

Table 1: Caravan 1

	$j=1$	$j=2$	$j=3$	$j=4$	$\prod_{j=1}^{4}$
$R_j = r_j^1 r_j^2$	16	12	10	5	$9\,600^a$
c_j	3	3	4	5	180^b
$u_j(c_j) = \frac{R_j}{c_j}$	$\frac{16}{3}$	4	$\frac{5}{2}$	1	$\approx 53,33^c$
P					2^d
$U(c) = \prod_{j=1}^{4} u_j(c_j) \times P$					$\approx 106,66^e$
$U_0(c) = 3\prod_{j=1}^{4} u_j(c_j)$					$\approx 160^f$

Notes: *a*: Resources value. *b*: Conservation drive. *c*: General motivation (Resources value corrected for conservation drive). *d*: Resource passageway. *e*: Resource caravan as impacted by the resource passageway. *f*: Caravan with resource passageway as endogenous component of the caravan.

Caravan 2 corresponds to a male engineer, aged 55, in a +5000-weapon industry firm.

Table 2: Caravan 2

	$j=1$	$j=2$	$j=3$	$j=4$	$\prod_{j=1}^{4}$
$R_j = r_j^1 r_j^2$	10	16	12	12	$23\,040^a$
c_j	4	4	3	4	192^b
$u_j(c_j) = \frac{R_j}{c_j}$	$\frac{5}{2}$	4	4	3	120^c
P					4^d
$U(c) = \prod_{j=1}^{4} u_j(c_j) \times P$					480^e
$U_0(c) = 3\prod_{j=1}^{4} u_j(c_j)$					360^f

Notes: *a*: Resources value. *b*: Conservation drive. *c*: General motivation (Resources value corrected for conservation drive). *d*: Resource passageway. *e*: Resource caravan as impacted by the resource passageway. *f*: Caravan with resource passageway as endogenous component of the caravan.

Caravan 3 corresponds to a female local sales manager, aged 59, in a major banking institution.

Table 3: Caravan 3

	$j=1$	$j=2$	$j=3$	$j=4$	$\prod_{j=1}^{4}$
$R_j = r_j^1 r_j^2$	12	9	12	20	$25\,920^a$
c_j	4	2	4	3	96^b
$u_j(c_j) = \frac{R_j}{c_j}$	3	$\frac{9}{2}$	3	$\frac{20}{3}$	270^c
P					2^d
$U(c) = \prod_{j=1}^{4} u_j(c_j) \times P$					540^e
$U_0(c) = 3 \prod_{j=1}^{4} u_j(c_j)$					810^f

Notes: *a*: Resources value. *b*: Conservation drive. *c*: General motivation (Resources value corrected for conservation drive). *d*: Resource passageway. *e*: Resource caravan as impacted by the resource passageway. *f*: Caravan with resource passageway as endogenous component of the caravan.

Caravan 4 corresponds to a female assistant-nurse, aged 54, in a residential home.

Table 4: Caravan 4

	$j=1$	$j=2$	$j=3$	$j=4$	$\prod_{j=1}^{4}$
$R_j = r_j^1 r_j^2$	10	12	12	16	$23\,040^a$
c_j	4	5	3	3	180^b
$u_j(c_j) = \frac{R_j}{c_j}$	$\frac{5}{2}$	$\frac{12}{5}$	4	$\frac{16}{3}$	128^c
P					3^d
$U(c) = \prod_{j=1}^{4} u_j(c_j) \times P$					384^e
$U_0(c) = 3 \prod_{j=1}^{4} u_j(c_j)$					384^f

Notes: *a*: Resources value. *b*: Conservation drive. *c*: General motivation (Resources value corrected for conservation drive). *d*: Resource passageway. *e*: Resource caravan as impacted by the resource passageway. *f*: Caravan with resource passageway as endogenous component of the caravan.

Caravan 5 corresponds to a female administrative manager, aged 61, in a governmental accounting service.

Table 5: Caravan 5

	$j=1$	$j=2$	$j=3$	$j=4$	$\prod_{j=1}^{4}$
$R_j = r_j^1 r_j^2$	5	10	9	16	$7\,200^a$
c_j	5	5	3	4	300^b
$u_j(c_j) = \frac{R_j}{c_j}$	1	2	3	4	24^c
P					3^d
$U(c) = \prod_{j=1}^{4} u_j(c_j) \times P$					72^e
$U_0(c) = 3\prod_{j=1}^{4} u_j(c_j)$					72^f

Notes: *a*: Resources value. *b*: Conservation drive. *c*: General motivation (Resources value corrected for conservation drive). *d*: Resource passageway. *e*: Resource caravan as impacted by the resource passageway. *f*: Caravan with resource passageway as endogenous component of the caravan.

Caravan 6 corresponds to a male sales operator, aged 33, in an international retail group.

Table 6: Caravan 6

	$j=1$	$j=2$	$j=3$	$j=4$	$\prod_{j=1}^{4}$
$R_j = r_j^1 r_j^2$	16	20	15	15	$72\,000^a$
c_j	4	4	3	3	144^b
$u_j(c_j) = \frac{R_j}{c_j}$	4	5	5	5	500^c
P					4^d
$U(c) = \prod_{j=1}^{4} u_j(c_j) \times P$					$2\,000^e$
$U_0(c) = 3\prod_{j=1}^{4} u_j(c_j)$					$1\,500^f$

Notes: *a*: Resources value. *b*: Conservation drive. *c*: General motivation (Resources value corrected for conservation drive). *d*: Resource passageway. *e*: Resource caravan as impacted by the resource passageway. *f*: Caravan with resource passageway as endogenous component of the caravan.

Caravan 7 corresponds to a male public junior high-school teacher, aged 61.

Table 7: Caravan 7

	$j=1$	$j=2$	$j=3$	$j=4$	$\prod_{j=1}^{4}$
$R_j = r_j^1 r_j^2$	15	15	16	16	$57\,600^a$
c_j	4	4	4	4	256^b
$u_j(c_j) = \frac{R_j}{c_j}$	$\frac{15}{4}$	$\frac{15}{4}$	4	4	225^c
P					4^d
$U(c) = \prod_{j=1}^{4} u_j(c_j) \times P$					900^e
$U_0(c) = 3\prod_{j=1}^{4} u_j(c_j)$					675^f

Notes: *a*: Resources value. *b*: Conservation drive. *c*: General motivation (Resources value corrected for conservation drive). *d*: Resource passageway. *e*: Resource caravan as impacted by the resource passageway. *f*: Caravan with resource passageway as endogenous component of the caravan.

Caravan 8 corresponds to a male restaurant cook, aged 40.

Table 8: Caravan 8

	$j=1$	$j=2$	$j=3$	$j=4$	$\prod_{j=1}^{4}$
$R_j = r_j^1 r_j^2$	12	16	8	16	$24\,576^a$
c_j	4	3	2	2	48^b
$u_j(c_j) = \frac{R_j}{c_j}$	3	$\frac{16}{3}$	4	8	512^c
P					2^d
$U(c) = \prod_{j=1}^{4} u_j(c_j) \times P$					$1\,024^e$
$U_0(c) = 3\prod_{j=1}^{4} u_j(c_j)$					$1\,536^f$

Notes: *a*: Resources value. *b*: Conservation drive. *c*: General motivation (Resources value corrected for conservation drive). *d*: Resource passageway. *e*: Resource caravan as impacted by the resource passageway. *f*: Caravan with resource passageway as endogenous component of the caravan.

Three main findings emerge from model computations that conform with fundamental COR theorizing. First the motivational value of a resource caravan does not limit to the level of its final score. Second, conservation motive is pivotal for conditioning patterns of resource caravans. Third, the working context has an impact on the configuration of resource caravans, depending on its perception by individuals, i.e. positive (as a resource passageway) or negative (as a demand).

With regard to resource caravans, results validate the assumption that motivation is dynamically organized into interactive processes of conflicting drives for development and conservation. Motivation should therefore not be limited to a psychological state reflecting a score of added resources. For example, most motivated individuals differ markedly with regard to their internal dynamics, as Caravan 6 ($U(c) = 2\,000$) relates to a rich pool of resources ($R_1R_2R_3R_4 = 72\,000$), while Caravan 8 ($U(c) = 1\,024$) draws from a much lower one ($R_1R_2R_3R_4 = 24\,576$). In the same vein, contrasting resource availability does not necessarily correspond to differing levels of motivation. For instance, resource-rich individual 7 ($R_1R_2R_3R_4 = 57\,600$) scores a similar level of motivation ($U(c) = 600$) to individual 3 ($U(c) = 540$), who ranks much lower in terms of psychological resources ($R_1R_2R_3R_4 = 25\,920$).

A next major finding is the importance of the preservation motive in shaping resource caravans. First, and in all cases, the impact of conservation drive cj decreases notably the initial motivational value of resources (R_j). Second, and in the case of very low resources availability, the impact of the preservation motive acts as an amplifier, thus contributing to minimal levels of general motivation (Caravans 1 and 5). Third, and conversely, in all cases of highest resourcefulness, motivation level $u_j(c_j)$ is least affected by resource conservation drive. Fourth, conservation drive affects differentially general motivation levels at medium levels of resourcefulness. Hence, the highest the impact of conservation on initial resources, the lowest the level of general motivation (Caravans 2 and 4). Conversely, lower levels of preservation relate to higher general motivation (Caravans 3 and 8).

Finally, results validate the view that context, as a subjective reality, has an impact and relates differently to the resource caravan. First it is notable that, for all individuals/caravans, there is an impact, positive or negative, of context on the motivational caravan. Hence, as compared to a neutral value of *P*, the resource caravan $U(c)$ relates to the positive, or negative, perception of its environment. For instance, for Caravan 1, the actual total value of the motivational caravan $U(c)$ is one-third less (106,66) than it would have been if the perception of context (value of 2) had been neutral (160 for a value of 3). This means that context is viewed as an adverse challenge to motivation. Conversely, for Caravan 7, context is rather perceived as a resource passageway ($P = 4$). The total value of the resource caravan is indeed one-third superior to a neutral perception of the environment ($U(c) = 900$, as compared to $U_0(c) = 675$). Not surprisingly, when context perception is neutral ($P = 3$), the total value of the resource caravan is similar to the neutral $U_0(c)$ benchmark (Caravans 4 and 5).

A second finding is the overwhelming impact of resource conservation on the value of a motivational caravan. In no case would a positive context (i.e., a resource passageway) substantially compensate for the motivational loss incurred by the preservation drive. For instance, in Caravan 2, the resource caravan benefits from a positive perception of the working environment. Yet, its total value ($U(c) = 480$) remains still very far from the initial score of its motivational resources ($R_j = 23\,040$). While differing in amplitude, a similar pattern is observed for Caravans 6 and 7.

DISCUSSION AND CONCLUSION

This research proposes a measurement design that reflects characteristics of motivational processes. Specifically, it translates the basic tenets of COR theory into a formal mathematical model that evaluates interactions between motivational resources, the environment and the drive for preservation. It presents motivation as a complex system whose structure is shaped by internal transformational processes between interacting variables. Formally said, motivational mechanisms operate like a mathematical function whose output corresponds to a resource caravan. An empirical test of this model among working professionals highlights psychological patterns that structure the motivation process. It also validates the decisive impact of the conservation drive on resource dynamics, both within and between individuals.

Main contributions of the present study are methodological and practical. First, with regard to methodology, it makes the case for measurement using formal mathematical modeling. While statistical modeling is primarily dictated by the data, mathematical modeling derives from assumptions to be modeled. In the motivation literature, as in I/O psychology in general, the data-analytical approach is prevalent. To the contrary, and except for expectancy theory (Vroom, 1964), we are not aware of any mathematical translation of main motivation theories (Herzberg, Mausner, & Snyderman 1959; Maslow, 1970; McClelland, 1961) for applied measurement in work organizations. An advantage of mathematical formal modeling is to explain quantitatively the psychological processes involved within a specific theoretical framework. As applied to COR theory, it promotes understanding of such complex constructs as resource caravans and resource passageways, and provides the tool for direct measurement of actual situations. This last point is a further advantage as recent math-based modeling of COR theory are limited to predictive frameworks of scenarios and simulations (Campano et al., 2013; Chen, Zhang, & Bu, 2022; Essalmi, Garrido, & Nashashibi, 2024; Ferreira-Chame, Pinto-Mota, & da Costa-Botelho, 2019; Shoss & Vancouver, 2024).

A second advantageous contribution is being able to evaluate, all at once, the real value of all system components as well as their impact on each other. For each individual, a score-sheet is provided that shows the relative impact, at a given time, of both the environment and the drive for preservation on resource variables. This corresponds to a person-specific approach that enables a fine-grained understanding and description of intraindividual variations (Howard & Hoffman, 2018). Whereas typical variable-centered methods seek to infer generalizable laws from the assumption that individual data tend to group around a representative average, a person-specific design sheds light on both diversity and heterogeneity of behavioral variations (Molenaar & Campbell, 2009; Saqr, Vogelsmeier, and López-Pernas, 2024).

At this point, we argue that methodological aspects of our formal exploratory approach open to practical implications, notably for human resource management. For instance, with regard to career management, where failed coaching can prove costly for organizations. In the case of highly-valued occupations, a formal access to motivational profiles can provide in-depth knowledge of individual psychological structure. As such, it allows customized coaching for individuals whose motivational resources are put to stress with potentially deleterious consequences on health and performance. Examples include sports professionals (Howard & Hoffman, 2018), and work in *exotic* environments (Harrison & Connors, 1984) defined by characteristics of isolation, confinement, and life-threatening situations (Rasmussen, 1973; Smith & Barrett, 2019; Tortello et al., 2018).

While providing a person-specific perspective to human resource management of high-profile individuals, the present research can also address issues for a broader spectrum of employees. One of these is performance evaluation. Typical performance-based appraisals evaluate all employees on similar standard regardless of how people go about their work. To answer this limitation, our study presents a tool that enables objective comparisons between individuals, while focusing on the mechanisms of intraindividual variations. Performance appraisal grounded in this type of individual formal profiling can help managers justify differential compensation decisions, while anticipating feelings of distributive injustice among employees (Van Woerkom & de Bruijn, 2016). Furthermore, a focus on motivational processes helps go beyond classic individual evaluations limited to a fact-based balance between positive and negative performance appraisals (Neville & Roulin, 2016). Instead, we argue that such a COR-based formal approach provides a strength-based alternative to the benefit of individual development and subsequent organizational performance.

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