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Procedia CIRP 37 (2015) 134 – 139

www.elsevier.com/locate/procedia

CIRPe 2015 - Understanding the life cycle implications of manufacturing

NEMAWASHI: Attaining Value Stream alignment within Complex Organizational Networks

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Abstract

In the process of value creation, organizations perform an intense intra-organizational dialog through which internal VS alignment is achieved towards certain strategic objectives. Within the context of complex organizational networks, were goal conflicts are preprogrammed through incentive structures, VS alignment as legitimation of action towards strategic goals has special interest. On the one hand it facilitates the access to necessary resources for goal achievement and on the other it increases the sustainability and supports commonly agreed upon decisions leading to success. This paper provides a winnerless process (WLP) differential equations model for quantifying intra-organizational value stream (VS) alignment dynamics that can help design sustainable lean management solutions. This paper presents ongoing research results that show how the model was implemented in one industrial facility.

Peer-review under responsibility of the organizing committee of CIRPe 2015 - Understanding the life cycle implications of manufacturing

Keywords: Nemawashi; Winnerless Process; Value Stream alignment in Complex Networks; HOSHIN KANRI TREE; (CPD)nA.

Nomenclature

根回し	**Nemawashi**: the process of consensus building.
HKT	Hoshin Kanri Tree. Lean management method.
KPI	Key Performance Indicators.
PO	Process Owner.
VS	Value Stream Flow.
WLP	Winnerless Process

1. Introduction.

The most important aspect of strategic planning is, according to [1], the strategy process: "a dialog through which knowledge is shared and consensus is achieved and commitment towards action and results is built". As shown in [2], consensus in organizations as legitimation of action towards certain strategic goals have attracted increasing levels of attention for legitimation facilitates the access to necessary resources to achieve such goals. These consensus can and should occur in different organizational settings, although in this paper the authors focus on those consensus related to the management of VS.

According to [3] organizations are complex systems that, from an information exchange perspective, can be considered as networks under the "organizational network" paradigm proposed in [4]. Typically the proper VS management comprehends the coordination of organizational clusters within such networks: different departments such as sales, engineering, production or logistics can be considered such clusters of highly interconnected hubs that are compelled to deliver coordinated solutions to ensure maximum VS performance. In this dynamics either they are all successful together or they will be unsuccessful individually.

The process of consensus building or **Nemawashi** can be described therefore as one in which all agents acting, at different levels; upon VS will reach a desired state after a

Peer-review under responsibility of the organizing committee of CIRPe 2015 - Understanding the life cycle implications of manufacturing
doi:10.1016/j.procir.2015.08.021

finite time throughout a winnerless process (WLP) where no agent wins in the sense described in [5]. We hypothesize that the achievement of VS consensus depends dynamically on the performance of all related PO and, without loss of generality, that these interaction are linear within a discrete period of time.

The effective VS goal achievement sought by different organizational clusters may be however many times conflicting thus increasing the uncertainty of the task. Galbraith [6] assertively conjectured that the principal managerial task is to reduce uncertainty by processing information: "A basic proposition is that the greater the uncertainty of the task, the greater the amount of information that has to be processed between decision makers during the execution of the task". Individual behavior of rational people trying to achieve a local optimum may lead to organizational disasters as shown in [7] referencing to [8]. From an organizational network´s perspective, it is therefore crucial to understand the organizational dynamics towards a consensus on the quest towards VS goals.

In order to achieve this, the paper is structured in five phases: Firstly, a background on complex organizational networks. Secondly, a model that describes the **Nemawashi** process and conditions for VS alignment is provided. Thridly, a **Nemawashi** management roadmap for implementation as well as several management implications are presented. Fourthly, one case study is presented so as to show the application of the model and make it replicable. Finally, we discuss the conclusions and limitations of the model and present possible further research.

2. Background.

Organizational complexity measures the level of interdependence between organizational units as shown in [9]. Neuroscientists as Friston introduces the concept of effective connectivity as the influence one neural system exerts over another [10].

In a series of papers along these lines [11] have introduced the concept of **organizational structural connectivity** as a way to understand structural organizational networks formed by:

- nodes, organizational agents or PO, and
- edges or KPIs (Key Performance Indicators) related to PDCA (Plan-Do-Check-Act) understood as ***(CPD)nA*** (Check-Plan-Do-Check-Plan-Do-…-Act).

The concept of **organizational effective connectivity** is now introduced as a way to understand organizational networks in which

- nodes are structural network clusters around hubs of high cluster coefficient, and
- which edges dynamically describe the underlying causal influences between them measured through certain VS related time-dependent KPIs.

Villalba-Diez et al. have shown in previous papers that when implementing HKT as a VS oriented lean-management method, organizational clusters form along VSs [12].

Following the hypothesis formulated in the introduction, this VS can be described by n KPIs x_i $i=1...n$ that represent the VS performance.

For obvious computation reasons, in order make the KPIs comparable, these x_i need to be normalized and bounded.

Normalization occurs when

$$x_i^*=(x_i-x_{imin})/(x_{imax}-x_{imin}) \quad (1)$$

being x_{imax}-x_{imin} the maximum and minimum value of $x_i(t)$ and therefore $0 \leqq x_i^* \leqq 1$.

Boundaries are set if $x_i^{**}=x_i^* \cdot (100/\sum_i x_i^*)$ (2)

The dynamic variation of this normalized performance x_i owned by one of these clusters can be described by the differential equation system described in (2)

$$d\,x_i/dt=f_i(x_1^{**},x_2^{**},...,x_n^{**},t)\ ;\ i=1,...,n \quad (3)$$

This set of equations describes a trajectory, the **Nemawashi** consensus curve, in an euclidean n-dimensional space given. The authors consider VS alignment is attained if in this n-dimensional state euclidean space the trajectory described by the **Nemawashi** curve presents asymptotic stability as shown in [13].

As indicated by Freedman [14], this set of differential equations can describe several types of interactions that can be modeled by deterministic mathematical models in population ecology such as the Kolmogorov model. The **Nemawashi** WLP is a consensus seeking process with linear interactions between the POs. Therefore it can be potentially modeled by the particular Kolmogorov case formulated by the generalized Lotka-Volterra equations shown in [15].

This paper presents two main contributions:

- A system of differential equations to describe the **Nemawashi** process is proposed as well as the necessary conditions for VS asymptotic stability are described.
- A **Nemawashi** management roadmap for implementation as well as several management implications are presented.

3. Nemawashi process and conditions for VS alignment.

In the process of value creation, organizational clusters consume resources that are limited and ought to be distributed among all. All structural clusters seek to maximize the value they generate out of the consumed resources. Simultaneously, poled by the aligning force of the strategy, all VS agents are compelled to strive for solutions that best serve whole system´s performance. Both centrifugal, cluster interest, and centripetal forces, strategic interest, are brought in equilibrium by the incentive structure given in the organization. This incentive structure is operationalized by the KPI.

A model that describes the consensus problem within this KPI structure consists on n structural clusters, whose performance can be measured through certain KPIs. The present work considers a generalized Lotka-Volterra set of differential equations to describe the WLP model given by (4):

$$dx_i/\mathrm{dt}=x_i^{**}\cdot(r_i-\sum_j a_{ij}\cdot x_j^{**})\ ;\ i,j=1,...,n \quad (4)$$

where $r_i \geq 0$ represent the growth rate of the i^{th} VS related KPI,

and a_{ij} represent a constant interaction between the i^{th} and j^{th} KPI. The matrix $\boldsymbol{A}=(a_{ij})$ is called the interaction matrix.