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148. Making Online Work, Work

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Abstract

Releasing the potential of online collaborative technologies in distributed work contexts is still a challenge for work systems managers. The availability of the technologies has outrun proven business models that can maximise the extraction of business value. Key problem areas remain in the management of online human interaction, control of business objectives within the medium, and risk management strategies. There are no easy technical solutions to these problems. In this paper the literature on online work systems is reviewed, key problem areas identified, and the solutions in the constrained human co-operation literature evaluated. The outcome variable demonstrates that traditional constraint models may be recast to explain some of the reported variation in online work systems.

Keywords: Online, Work, Systems, Co-operation, Constraints

Introduction

The literature on virtual enterprises elaborates the potential business benefits of virtual teams and distributed work systems. In particular the exploitation of technologies for collaboration has potential for leveraging human capital to achieve work objectives and enlarging an enterprise reach through talent pooling. Distributed work systems may deploy across time and geographical boundaries to achieve business objectives. For example the manufacturing of the Airbus aircraft that is distributed over 24 x 7, across 16 different sites in Europe, and is controlled through Catia computer-aided design software. The business potential for distributed work systems are great in the theoretical sense but have proved more difficult to implement effectively in practice (for example the Airbus Catia version problems and the adverse business consequences). A brief review of the literature in various work contexts showed that many problems still exist for effective management of online and distributed work systems. The key problem areas were technology reliability, end user competency and team skill training. All the literature identified these problem areas but considered the problems to be stepping stones to a better and more productive future rather than barriers.

The situation participants find themselves in for doing online work and distributed work is one of constraint. The constraints are various in nature but they all converge at the participant (worker). Wood et.al (2004, p. 2) argued that a virtual work system has three distinct structural components, namely, "An agent structure", "A conversation or collaboration structure", and "A service or obligation structure". Leimeister et.al. (2004, p. 2718) centered the user (worker) in the virtual work system within the actor model. The preferred interfaces for actors overlapped a "Product and Service Model" and the "Revenue Model". These two frameworks for conceptualising the virtual and the distributed work system focus attention onto the people in the enterprise. Alter (2002, p. 65) provides a simple definition of the people in an organisation as being the "internal" and the "external" customers. In this paper the actors are best determined as internal customers (and shall be termed "customers"). The

work of a system is determined as a function of human actors performing business processes that require resources. In this sense online and distributed work systems are contained within limitations that constrain the functionality of work. In this paper the term “online work” is to be used to span the differentiations of virtual and distributed work. Online work is used to contain all work attempted through electronic media. In the following sections various online and collaborative work contexts are defined as boundary problems, and then previously published constraint model solutions evaluated. In conclusion it is demonstrated that traditional constraint models may be recast to explain some of the reported variation found in online work systems.

Online Work

The success of work teams is determined by the levels of co-operation between the customers and is a function of the capacity of a team to achieve organisational objectives. The scenario is a trade-off between a group working together and the achievement of objectives. A group may choose to work in various ways but in a business context the constraint of control is usually managed by an internal customer. The possible outcomes are summarised in Table 1.

Table 1: Objective Group Trade-offs

		Business Objectives	
		<i>Not Achieved</i>	<i>Achieved</i>
G r o u p	<i>Dis-functional</i>	Bad Management	Management by Mistake
	<i>Functional</i>	Poor Management	Good Management

Group work may be achieved by coercion or by co-operation and often constraints are imposed to guide group behaviour towards objectives as both incentives and sanctions. The trade-offs present situations that are both dangerous and beneficial to the business organisation. The risk may be described as a trade-off curve (or line) and the degrees of volatility around the profitable target measured. The possible outcomes are found in Table 2.

Table 2: Co-operation Coercion Trade-offs

		Co-Operation	
		<i>Not Achieved</i>	<i>Achieved</i>
C o e r c i o n	<i>Sanction</i>	Dangerous Confinement	Unsustainable Control
	<i>Incentive</i>	Poor Dynamic	Optimal Performance

The problems associated with work attempted by teams in general business situations are intensified in online work. The use of electronic media to facilitate the work processes removes some of the boundaries found in traditional work environments. It also varies the consistency of interactions where, for example, the body language that is accessible in face to face meetings is either not available (eg. in email or discussion strands) or it is mitigated by the technology (eg. in video meetings). Most work places use a mixture of online and real interaction to achieve work objectives. This includes formal and informal communications, voice, text, images, tables, charts, and brand aura. The staging of communication media presents compensation for the deficits in each. For example, customer A emails customer B. Customer B then voice calls customer A to seek clarification of the matters because customer B considers the voice communicated has capability for verification, elaboration and authentication of the email communication. The result may be that customer A then faxes or emails back further rich media to complete the interaction. The problem is that the range of media that may be staged for standard business situations is more than what may be effectively staged in 7 x 24, geographically disperse, and language / cultural divided online work contexts (see for example Clear (2004) for problems in online software development between New Zealand and Swedish work contexts). The online media has less staging compensations for work and hence fewer boundaries in which work problems may be conditioned.

A work system has been defined with nine elements (see Alter 2002, p. 5) that specify the boundaries to an internal system. Within the system sub-types may also be defined such as “information systems, projects, supply chains, ecommerce, and other important types of systems (that) can be modelled as special cases of work systems” (Alter, 2004, p. 4257). The argument that Alter (2004) raises is that sub-systems inherit (the “partial inheritance conjecture”) most but not all of the “elements, properties and propositions” of the work system. Online work is consequently classified as a sub-system type with some but not all of the capability of the business work system. Stamps & Lipnack (2000) developed a similar argument to focus attention onto the causal factors for successful online work systems. Purpose takes a higher weighting in online team work than it does in general business work teams “because (online teams) operate outside the bounds of traditional organisational life without bureaucratic rules and regulations to guide them” (Stamps & Lipnack, 2000, p. 241). Online work hence inherits some of the characteristics of the general business work system but has a different dynamic and managerial problem set. The dynamic is captured in the elements of purpose, people links, and time. Table 3 summarises from the literature the critical organisational elements for successful online work.

Table 3: Online Work Organisational Elements (Adapted from Stamps & Lipnack, 2000, p. 240).

	Inputs	Processes	Outputs
Purpose	Goals	Tasks	Results
People	Members	Leadership	Levels
Links	Media	Interactions	Relationships
Time	Calendar	Projects	Life cycles

Table 4 addresses the problem of approaching online work as a collaborative activity. There are process gains and process losses that require analysis before collaborative work groups are adopted. The manager is challenged to control these trade-offs for the best extraction of business value.

Table 4: The Online Work Trade-offs (Adapted from Turban et.al., 1998, p. 355)

Process Gains	Process Losses
Synergy	Attention Blocking; Failure to Remember; Conformance
Learning	Pressure; Evaluation Apprehension; Free Riding; Airtime
Stimulation	Fragmentation; Attenuation Blocking; Concentration
More Information	Blocking; Socialising; Domination; Information
More Precise Information	Overload; Flaming; Slower Feedback; Fewer Information
More Objective Evaluation	Cues; Incomplete Information Use; Incomplete Task
Effects are dependant on facilitation techniques	Analysis; Coordination Problems; Effects are dependant on facilitation techniques.

Collaborative Work

A business work system that functions according to the business plan delivers outputs that are in keeping with the goals and objectives of the business. Collaborative online work extends the business human capital resource to include external consultants and experts as well as collaboration within the internal human capital resource. The business boundary is shifted and resources that were previously in the external environment can be included in the internal business environment. The selection of business relationships is constrained to those that are beneficial to the business plan rather than only those available within the enterprise system. In geographically distributed organisations (eg. multi-national corporates) collaboration can occur across traditional boundaries and silos within the enterprise system. In Table 3 the causal chain for online work runs from the media to the interactions through to the output of relationships. As a causal chain one link passes quality and grade to the next so that for example, if the media (the technology, the HCI, the functionality) is poor then the quality of interactions can be adversely effected. However, if the management of interactions is poorly done then the output of business relations carries two distinct deficits. The constraints within the online work system are hence inter-dependent and contingent to agreed service levels.

The links of media, interactions and relationships are critical to collaborative online work viability (Table 3.). Research in this area is under pinned by multi-agent investigations that trade off various inter-dependent constraints with in-dependent constraints. Szilagy (2003), for example extended the traditional dilemma model to include agents with personalities. In a similar sense avatars have had the properties extended until the traditionally 0 to 6 properties become many more so that avatars mediate interaction in complex situations such as the games Diablo II and World of Warcraft, and multi-level supply chain transactions. Szilagy (2003, p. 829) proposes that computer simulation can be used to model social behaviour. Klabbbers (2006) also adopts a similar position by arguing that games extend mathematical simulation beyond the limits of particular solutions and towards social and economic explanations (eg. see the generic model of games and simulations, p. 42). These views lead to a convergence of utility for collaborative online work. The online worker has many more properties than a simple avatar allows. In Szilagy's (2003) work it is possible to define the personalities and to prescribe personalities for specific functionalities. The implication of this approach is to move into the online customer's space and to provide guidance regarding acceptable and unacceptable online behaviour to a far greater level of precision than is currently available in end user rules and cyber ethics guides. For a collaborative online work system the controls may be specified for tasks and interactions at the process level.

Work As Social System

Online work has shifted the locus of control from immediate human managerial relations towards the inner motivation of the customer. The responsibility for online performance is very much in the hands of the customer. The initial skill set may be learned in training where the mastery of the technology can be acquired. However, the economic productivity and business benefit accrue from the formation of social networks with business value. These constructs are social in nature and the customer has the capability to co-operate in the collective interest or to pursue their own selfish interests. In Table 2 the four customer outcomes are defined. In the instance where sanctions are applied and no co-operation is gained the business is at risk of counter productive customer action. This may include litigation for compensation and action against the brand. In the second instance where sanctions are applied to achieve the online work outcome of co-operation the inner motivation of the customer may be low and result in their leaving or failing to reproduce the behaviour unless further coercion is applied. The third outcome where incentives are used but co-operation is not achieved indicates that self interest prevails and the business value is minimised. The customer in this instance is consuming resources but not producing the required added value. The fourth outcome is the expected outcome of productive online work. The customers are creating social networks in keeping with the business goals and objectives and the social networks are accruing capital worth for the enterprise system.

Traditionally constraint models have relied on two person games to simulate decision-making behaviour. However investigations of collective behaviour require many agents that may be persons, organisational units or any decision-making entity. Szilagyi's (2003) innovation was to develop a model for a large number of decision-makers that would allow for different agent personalities all interacting in the same experiment. The inclusion of personalities extended previous attempts to simulate social systems by allowing for non-rational behaviour by agents. The five personalities chosen to simulate constrained work interaction were, Pavlovian (ie. responsive to rewards & penalties), predictable (ie. fixed personality such as angry, benevolent, and so on), the accountant (ie. always calculates the optimal output from previous interactions), the conformist (ie. follows the majority), and the greedy (ie. imitates another who has the highest reward). The results of Szilagyi's (2003) experiments (simulations) are instructive for social work systems that impose constraints on the customers. Szilagyi's (2003, p. 836) pay-off curves show that social systems that have less than 73% co-operation tend towards lower levels of co-operation and any system that starts with less than 69% co-operation levels between the customers regresses to the dis-functional tragedy of the commons status. These figures came from the common work situation where customers have the freedom to respond to rewards and penalties in the work environment in both rational and non-rational ways.

Constraint model social system simulations provide explanatory power for the reported demise of many online work attempts (see Costain, 2000 and so on). Internal customers come to the work situation with a variety of motivations that are often reflected by their personalities and the behavioural characteristics. An internal customer who is angry because an expectation has not been met is likely to act in a way that counters co-operation whereas a conformist is likely to follow a group consensus regardless of other risks that may be taken. These simple concepts make sense in a general business work team and the reviewed literature suggests that the problems of the usual work context are inherited in the online context. The online context in fact exuberates problems because restraining perceptions and

boundaries are often absent in the media. Costain's review reported that despite the large sums of money invested into online work systems, productivity had not increased. A constraint model explanation for these events would consider the levels of co-operation in the work system prior to the capital investment in the new online systems.

Recasting Constraint Models for the Web

Online work systems present a new high stakes challenge for managers. The probability of gaining the required levels of customer co-operation are low but the rewards from gaining 75% or more co-operation before entering into online work are great. A solution to this dilemma is found in the reworking of the traditional constraint models for the online world. The traditional constraint model (eg. Flood & Dresher, 1950; Tucker, 1954) declares that risks and rewards are associated with decision-making. The scenario is that two bank robbers are in jail and offered a choice of confession or silence. The reward for confessing is traded against the actions of the other with diminishing returns depending on who decides which course of action. This scenario exploits a conflict between individual and group rationality and offers no easy solution for internal customers. The manager of online work is in a similar predicament. The internal customers must co-operate and co-operate at a very high level to achieve the business objectives in the online medium yet the pay off for non-cooperation can be higher.

The customers in an online system are like prisoners in many different cells. They share a common interest in the pay-offs from co-operation and non-cooperation in the online work environment. All are more interested in their personal gains from the interaction than the well being of the processes and the owner of the brand (unless damage to process or brand negatively affects the payout). For example, non-co-operation may provide the individual with time resource benefits, avoidance of an unwanted task or activity, and so on. Whereas co-operation may give an excessive work loading and diminished personal (selfish) profile. The online work manager must then offer to each a dilemma that challenges self interest and weights towards the best pay-off for co-operation. As Table 2 establishes incentives alone are not predictably mutually beneficial. The best offer shows that co-operation is clearly the best choice and that the risks of taking other options are of diminishing worth. The customers may co-operate or not and hence co-operation alone (the individual) gives the biggest pay-off. Co-operation by others diminishes the attraction of co-operating because the work loading and pay-offs become distributed hence the online work manager must offer mitigation in the form of attractive and fair loadings with personal recognition. Account can also be made of the extra messaging and duress associated with effective business interaction. The option of non-cooperation by all customers may be addressed by exclusion from pay-offs and inclusion in sanctions. This option is particularly important for eliminating freeloaders who hide behind others in the online work system but are able to associate with the successful outputs of others. Finally the online work manager must define a moment in time where the decision to co-operate or otherwise is audited.

Discussion

The constraint model literature provides explanatory power that addresses the pressing problem of online work failure. Online work is a high risk area for business enterprise systems and requires a different set of management skills to extract the best value from the opportunity. The constraint literature shows that success in online work has a small probability and failure has a high probability. This is a different starting point for research

where initially the researcher has evidence showing that only under restricted conditions with specific constraints can a business person predict a positive return on the investment in the technology. Other approaches assume that by fiddling structural considerations online work can be tuned to deliver optimal performances. The constraint literature starting position centers the internal customer and provides a calculus of self interest with benchmarks established by experiment. Self interest is under valued in the online work literature and little consideration is given to non-rational actors. For example the three distinct structural components defined in Wood's (2004) model (page 2) give no consideration of agents who may be disaffected or wise to avoiding work. Similarly Leimeister's (2004) model (page 2) assumes rational compliant customers within a stable system.

The implications taken from the constraint literature are instructive for business managers working in hybrid real and virtual environments. Explicitly the manager must expect a range of rational and non rational actors who may co-operate or not in the achievement of business objectives. In addition the online work system will have inherited some of the problems from the general work system and in the online environment some of the problems will be more dangerous than in the general context on account of the different boundary conditions (see page 3). A managerial solution is to set targets and performance expectations in keeping with constraint model metrics (see page 7). The logic for management also follows from the constraint metric model (see page 8) so that the internal customer is presented with a predicament in which the options are weighted towards optimal performance (see table 2). This is a different approach to management than that which has been advocated in the literature. It is the internal customer who has a predicament and not the manager. The manager's role is to manage customers through a decision-making process that is directed towards optimal business performance. In this sense the recasting of traditional constraint model literature for online work has provided a set of controls in which a business may match personalities to performances and then manage human interaction for the maximum business benefit.

Conclusion

There are no technical solutions for all the problems that arise during the doing of online work. In this paper the explanatory power of traditional constraint theory has been applied to online work situations and managerial strategy subsequently derived for extracting business value from the technology. The focus of research was shifted from the technology and onto the social relationships associated with the technology in order to identify ways of gaining a greater return from the IT investment. Some of the reported variation in online work systems has been explained.

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