Bulletin of the *Transilvania* University of Braşov
Series VII: Social Sciences • Law • Vol. 9 (58) No. 1 - 2016

TOWARDS A SYMBIOSIS HUMAN/TECHNOLOGY/ORGANISATION. THE CASE OF BANK EMPLOYEES IN GABON

Kader INAGNIBOMOUA[1]

Abstract: *This article analyses the reports that the bank employees in Gabon have with IT&C. More precisely, it is based on the symbiotic approach of Braniger (2002) which states that our uses and practises at work are transformed with the evolution of IT&C. The research that we have conducted shows that there is an optimisation of the symbiosis on two levels: usability and technology. In contrast, functionality remains a feeble point at the level of man and of the organisational context. We could ask ourselves if it is necessary that supplementary efforts be made concerning the quality of internal and external recruitment, and at the level of training programmes inside factories and in general learning, in order to improve the level of knowledge and competence of the employees.*

Key words: *IT&C, symbiosis, functionality, usability, regulation, relationship human/technology/organisation.*

1. Introduction

The term 'symbiosis' was first used by the German botanist de Bary in 1879 to define a relationship of continuous interdependence between two living beings of different nature. Symbiosis is thus defined as the process by which two different species mutually help each other. Currently, this concept is applied to the mother-child relationship (Hammes-Adelé, 2011), man-nature relationship (Hammes-Adelé, 2011) or man-technology relationship (Bender, De Haan, & Bennett, 1995; Brangier, 2003; Licklider, 1960; Rosnay, 2000; Roth, Bennet, & Woods, 1987). In this research we are going to concentrate particularly on the relationship between man and technology.

The man and the machine indeed develop a mutual interdependence, in the sense that technology cannot function without the human side and the human cannot reach a certain performance without technology (Licklider, 1960).

According to Brangier, Dufresne and Hammes-Adelé (2009), in order for technology to match the symbiotic approach, it has to respect the following criteria: amplification of intelligence, perceptive augmentation, operative acceleration, management of knowledge in a given context, emotional balance, resilience in error management, reduction of distractors and continuity of the informational flux. That done, technology will become

[1] University Paris Ouest Nanterre La Défense, EA3486-LAPPS, kaderpyere@yahoo.fr.

the ideal symbiont of the human being, in order to help and supplement him in his daily activities physical and cognitive) in both the domestic and professional areas.

2. The symbiotic approach human-technology-organisation

According to Brangier (2002) our means of working, living and thinking are transformed alongside the technical system within which they take place. Technology acts upon the human being and the human being in its turn acts on the technological factors which determine him. The nature of the undergoing relationships allows to explain the value of new technologies and the orientation of the human behaviour in the technological systems. Therefore, these technical devices cannot be seen only as an application of scientific knowledge aiming to substitute the human being with punctilious techniques.

They have to be apprehended as conditions of human existence, namely as extensions of our perceptive, motor, cognitive, social and affective properties and qualities in work-related or life situations. Human activity itself is recomposed by the technology which became, as time went by, an object of study of Humanities and particularly of Work Psychology and Ergonomics.

The IT&C conception is currently oriented towards the transformation of the psychological states of the users. It is no longer about acting upon the material, but rather acting upon thought or, moreover, considering the material as a material of thought. The symbiosis is therefore researched to provide an extension to the individual. It is considered both a type and a process of the relationship between man and technology in the sense that it aims to assist and/or help the operator in a given activity, to second him so that he should reach a higher level of comfort, effectiveness, satisfaction, security, productivity or even life quality. The symbiosis is also a process because its research is connected to the way in which the work situations are conceived or arranged.

Seeing the symbiosis as a process entails noticing that the symbiosis between man and technology is based on a series of active elements aiming to establish, maintain and develop this relationship. This model is schematically presented in table 1.

The symbiosis process (functionality, usability, regulations) (Brangier, 2003)

Table 1

	Functionality	Usability	Regulation	Symbiosis Conditions
Level of Technology	S(f)	U(S(f))	R(S)	S(f)≈U(S(f))≈R(S) Symbiosis optimised at the level of technology
Level of Man	H(f)	H(S(f))	R(H)	H(f)≈H(S(f))≈R(H) Symbiosis optimised at the level of man
Level of Organisational Context	W(f)	W(S(f))	R(O)	T(f)≈T(S(f))≈R(O) Symbiosis optimised at the level of the organisation
Symbiosis Conditions	S(f)≈H(f)≈ W(f)	U(S(f))≈ H(S(f))≈ W(S(f))	R(S)≈R(H) ≈R(O)	

f: functionality, U: usability, W: Work, R: regulation, H: human, S: symbioses

The sign ≈ corresponds to the proximity, to the compatibility of the models under discussion.

This theoretical model is based on three main factors:

a) Functionality is the action that a technical system allows the realisation of. For example, one of the functionalities of the telephone is oral communication (Hammes, 2011). In order for symbiosis to exist, the functionality 'f' proposed by IT must be compatible with work 'W' of the human 'H', which Brangier translates as $S(f) \approx H(f) \approx T(f)$. In other words, the totality of functionalities proposed by the technical systems has to correspond with the perceptions which the employee has upon his own work.

b) Usability refers to the ease of use of the technical system, often expressed by the level of compatibility between the human, the technology and the task at hand. According to Griffith (2006), it is considered to be a necessary, but not sufficient condition in itself to explain the symbiosis model. It can be formalised as $U(S(f)) \approx H(S(f)) \approx T(S(f))$.

c) Regulation. In order to be used, a technology not only has to provide pertinent and easily accessible functionalities, but also has to be situated in a social context which accepts it. In other words, it has to lead to socio-organisational regulations which will generate favourable attitudes and representations.

Table 2

The characterisation of the three dimensions of symbiosis (human-technology-context)

	Functionalities	**Usability**	**Regulations**
Technology	How the artefact facilitates the discovery of its usefulness	How the artefact allows coupling	How the artefact can adapt to situational characteristics
Human	How the human perceives possible uses of the artefact	How the compatibility of the artefact is assessed	How the human evolves via interaction
Context	How the proposed functionalities integrate in the context and interpret it	How the manner of using the artefact guides the actions in context	How the context shapes itself around the device

The symbiosis model studies the coupling conditions between the humans and technology in a given context. It targets a reflexive human-technology relationship in which technology acts upon the human while the human also models technologies, either by conceiving them or personalising them.

The relationship man-technology corresponds to a sort of 'techno symbiosis' and the IT devices are, metaphorically, new symbionts. This model was operationalised in table 2.

3. Method

3.1. Participants

Our sample is made of 136 employees (77 males) aged between 30 and 60, working in the banking sector in Gabon. 44% of them have less than 5 years length in service and 7% of them have more than 15 years length in service.

3.2. Material

The Brangier and Hammes scale (2007), measures the relationship man-work-organisation starting from the symbiosis model. We should remember that symbiosis entails three processes (functionality, usability and regulation), associated to three distinct domains (technology, man, organisational context). Each process is decomposed in sub-dimensions. The scale comprises 27 items (from I1 to I27), the repartition of which is presented in table 3 below. The answers to every item are given on a Likert-type scale on six points, going from *not at all exact (1)* to *totally exact (6).* A high score thus indicates a high level of symbiosis.

Table 3

Repartition of the questionnaire items reporting to the scale of Brangier and Hammes (2007)

	Functionnality			**Usability**			**Regulation**		
	Without mastery	Operative mastery	Cognitive mastery	Without perceived usability	Simplicity of use	Ludic use	without	managed	innovated
Level of technology	Q1	Q2	Q3	Q10	Q11	Q12	Q19	Q20	Q21
Level of the human	Q4	Q5	Q6	Q13	Q14	Q15	Q22	Q23	Q24
Level of organisational context	Q7	Q8	Q9	Q16	Q17	Q18	Q25	Q26	Q27

3.3. Procedure

After having obtained the authorisation of the bank we have briefly exposed the objective of our research to the employees, mentioning that it was an academic research and that it was not by any means conducted by their management. 150 questionnaires were then distributed to the employees, and, two months later, after more attempts, 136 of them were taken back.

4. Results

Table 4 presents the average values and Standard Deviations obtained for each factor and each level of the symbiosis.

An Alpha Cronbach of .89 was calculated with all items. The deletion of any item increases the value of alpha. The alpha values per factor and per level of symbiosis are

completely satisfactory (from .68 to .86). Moreover, the correlations between the factors on the one hand and between levels on the other hand of the symbiosis are moderated but not to be neglected (from r=.59 to r=.89).

This scale thus presents satisfactory psychometric values, both at the level of internal consistency calculated by factor and by level of symbiosis and at the level of inter-factors and inter-level correlations.

Globally, the average of the sample is A=3.96 (SD=1.02). At the level of the factors of symbiosis the regulation obtains an average (A=4.09; SD=.98) which is significantly higher than the one obtained by functionality (A=3.83; SD=1.06). Additionally, the averages obtained for the three levels of symbiosis are not significantly different.

Table 4

Analysis of the factors of the process (functionality-usability-regulation) and of the different levels of symbiosis

		Factors of the symbiosis			**Condition of symbiosis**	
		a. Functionality	b. Usability	c. Regulation	Total	p
1. Level of technology		4.16 (.97)	3.96 (.96)	3.98 (.93)	**4.03 (.94)**	**pa=pb=pc** Symbiosis optimised at the level of technology
2. Level of the human		3.56 (1.19)	4.03 (1.04)	4.20 (.90)	**3.93 (1.04)**	**pa<pb=pc**
3. Level of the organizational context		3.78 (1.03)	3.91 (1.09)	4.08 (1.19)	**3.92 (1.08)**	**pa<pc pa=pb pb=pc**
Condition of symbiosis	Total	**3.83 (1.06)**	**3.96 (1.02)**	**4.09 (.98)**		
	p	**p1>p3=p2**	**p1=p2=p3 :** Symbiosis optimised at the level of usability	**p2>p1 p1=p3 p2=p3**		

However, a more punctilious analysis of the results by process, shows that:

- As far as functionality is concerned, the level of technology A=4.16 (SD=.97) obtains a significantly higher average than those registered on the other two levels, A= 3.56 (SD=1.19), A =3.78 (SD=1.03) respectively;

- As far as usability is concerned, the average values are not significantly different to a point of .05;
- When it comes to regulation, the human level obtains an average (A=4.20; SD=.90) which is significantly higher than the one obtained at the level of technology (A=3.90; SD=.93).

The analysis of the results obtained per level reveals that:

- Regarding the technology level, the average values are not significantly different to a point of .05;
- Regarding the human level, the usability process and the regulation obtain average values of A=4.03 (SD=1.04) and A=4.20 (SD=.90), significantly higher than those registered at the level of functionality (A=3.56, SD=1.19);
- Concerning the organisational context level, the regulation process obtains the average value of A= 4.08 (SD=1.19), which is significantly higher than the one registered at the level of functionality (A=3.78; SD=1.03).

Generally, all the average values were associated to moderated scores of dispersion of the answers (from .90 to 1.09).

We can therefore conclude that the obtained average of functionality is significantly higher at the level of technology whereas the regulation average is significantly higher at human level. Table 4 also demonstrates that the symbiosis is optimised.

4. Discussion

The results indicate that the employees working in the banking sector have satisfactory connections with IT&C, In other words, the reports that the employees from Gabon have with IT&C are connected to their use of these technologies at work.

We observe an optimisation of the symbiosis at two levels: (a) at the level of usability and (b) at the level of technology. This explains (a) the ease of use of the technical system, expressed by the level of compatibility between the human, IT&C and the task at hand and (b) the good quality of the technology, assessed by its functionalities, its use and the context of its use.

This finding could be justified by the fact that in Gabon there is a political will to conduct concrete actions aimed at creating a favourable context for the outbreak of IT&C.

However, although it seems clear that Gabon is open to creating a suitable frame for the IT&C devices in factories, the human factor is a reality which should be by no means neglected. In this direction, we observe that the functionality remains a feeble factor at human level and at the level of the organisational context.

We could ask ourselves if it is necessary that supplementary efforts be made concerning the quality of internal and external recruitment, and at the level of training programmes inside factories and in general learning, in order to improve the level of knowledge and competence of the employees.

Numerous authors (Black & Lynch, 2000; Turcotte & Whewell Rennison, 2004) have included such aspects in the notion of *'human capital'*.

Although Gabon is one of the few countries in Africa where the tuition rate is around 80%, the capacity of absorption of the factories (Cohen & Levinthal, 1989), meaning their aptitude to acquire new knowledge, transform it and finally exploit it for commercial purposes seems still fragile.

Other information may be obtained from the address: kaderpyere@yahoo.fr

References

Bender, J., De Haan, J., & Bennett, D. (1995). *The symbiosis of work and technology*. London: Taylor & Francis.

Black, S. E., & Lynch, L M. (2000). *What's driving the New Economy: The Benefits of Workplace Innovation*. NBER Working Paper, No. 7479.

Brangier, E. (2002). L'assistance technique comme forme de symbiose entre l'homme et la technologie. Esquisse d'un modèle de la symbiose homme-technologie-organisation [Technical assistance as a way of symbiosis between man and technology. A sketch of a symbiosis model between man-technology-organisation]. *Revue d'Interaction Humain-Machine*, *3*(2), 19-34.

Brangier, E. (2003). La notion de «symbiose homme-technologie-organisation» [The notion of 'symbiosis between man-technology-organisation']. In: N. Delobbe, G. Karnas, & Ch. Vandenberg (Eds.), *Evaluation et développement des compétences au travail* [Evaluation and development of competences at work], pp. 413-422. Louvain: Presses Universitaires de Louvain.

Brangier, E., Dufresne, A., & Hammes-Adelé, S. (2009). Approche symbiotique de la relation humain-technologie: Perspectives pour l'ergonomie informatique [Symbiotic approach of the relationship between human and technology: Perspectives for IT ergonomy]. *Le Travail Humain*, *72*(4), 333-353.

Brilman, J. (1995). *L'entreprise réinventée* [The reinvented factory]. Paris: Editions d'Organisation.

Cohen, W. M., & Levinthal D. A. (1989). Innovation and Learning: The Two Faces of R & D. *The Economic Journal, 99*(397), 569-596.

De Bary, A. (1879). De la symbiose [On Symbiosis]. *Revue internationale des sciences*, *3*, 301–309.

De Rosnay, J. (2000). *L'homme symbiotique* [The Symbiotic Human]. Paris: Seuil.

Griffith, D. (2006). Neo-symbiosis: a system design philosophy for diversity and enrichment. *International Journal of Ergonomics*, *36*(12), 1075-1079.

Hammes-Adelé, S. (2011). *Traduction temporelle de la relation humain-technologie-organisation. Validation et perspectives autour de la symbiose* [Temporal translation of the relationship between human, technology and organisation. Validation and perspectives around the concept of symbiosis]. Thesis sustained in view of obtaining the PhD degree at Université Paul Verlaine – Metz.

Licklider, J. C. R. (1960). Man-Computer Symbiosis. *IRE Transactions on Human Factors in Electronics*, HFE-1, 4-11.

Roth, E. M., Bennett, K., & Woods, D. D. (1987). Human Interaction with an Intelligent Machine. *International Journal of Man Machine Studies*, *27*, 479-525.

Turcotte, J., & Whewell Rennison, L. (2004). The link between technology use, human capital, productivity and wages: firm-level evidence. *International Productivity Monitor, Centre for the Study of Living Standards*, *9*, 25-36.