Knowledge Waste & Knowledge Loss – What is it All About?

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ABSTRACT

In this paper we are interested in developing an understanding of the concepts of knowledge waste and knowledge loss. The latter can in the worst case lead to "a decreased capacity for effective action or decision making in a specific organizational context" (DeLong, 2004, p. 21). Whereas knowledge waste means that companies are not using the full capacity of existing knowledge. As outlined by Ferenhof (2011) it is any failure in the process of knowledge conversion. These definitions imply differences between the concepts, the literature however suggests that many authors uses them interchangeably. Is that correct? Are the concepts important, of relevance? The present article´s aim is to highlight the importance of having better insights into the concepts. The authors believe that both theory and corporate practice will benefit from an improved understanding.

Keywords: Knowledge Waste; Knowledge Loss; Knowledge Management; Survey.

Desperdício e Perda de Conhecimento: Do que se trata?

RESUMO

Neste trabalho estamos interessados em desenvolver uma compreensão dos conceitos de desperdício de conhecimento e perda de conhecimento. Este último pode, no pior caso, levar a "uma diminuição da capacidade de ação efetiva ou tomada de decisão em um contexto organizacional específica" (DeLong, 2004, p. 21). Sendo que, desperdício de conhecimento significa que as empresas não estão usando a plena capacidade do conhecimento existente. Conforme descrito por Ferenhof (2011) é qualquer falha no processo de conversão do conhecimento. Assim, estas definições implicam diferenças entre os conceitos, a literatura, no entanto, sugere que muitos autores as utilizam alternadamente. Isso está correto? São os conceitos importantes e, de relevância? O presente artigo objetiva destacar a importância de ter uma melhor compreensão sobre esses conceitos. Acreditamos que a teoria e a prática empresarial irão beneficiar-se de uma melhor compreensão destes conceitos.

Palavras-chave: desperdício de conhecimento; perda de conhecimento; gestão do conhecimento.

INTRODUCTION

Given the competitive pressure firms are facing in today´s business environment, a waste and/ or loss of knowledge is not only costly (Bolisani et al., 2013) but also dangerous. As the outcomes can result in situations in which valuable resources and time are bound and thus not available to other more important business operations or are even lost in the worst case. In sum we look at knowledge from a knowledge at risk perspective, i.e. addressing situations in which knowledge becomes a liability or a risk (Durst, 2012). These terms, however, are seldom discussed or used interchangeably. But are the terms talking about the same thing? Against this background, the purpose of this paper is to develop our understanding of knowledge waste and knowledge loss. Given the importance of knowledge to companies, a better understanding of the differences and similarities as well as challenges and opportunities of knowledge waste and knowledge loss could assist practitioners to better cope with the knowledge risks that can occur in organizations.

The study is based on a survey conducted with international KM experts. These experts were invited to the survey during the 7th International PhD consortium of European Chair on Intellectual Capital Management of Paris-Sud University (4-6 June 2014), and at the 9th International Forum on Knowledge Asset Dynamics (IFKAD) (11-13 June 2014) held in Matera (Italy). In total, twenty participants took part in the survey.

THEORETICAL BACKGROUND

Following, we briefly introduce the terms of interest.

Knowledge loss can be the result of personnel turnover, e.g. a company loses a key organization member (i.e. those ones who are experienced and tenured). Facing such a situation can put the company in a very vulnerable position. This applies to SMEs in particular and in the worst case puts their survival at risk (Durst & Wilhelm, 2011).

In the context of turnover, especially the tacit knowledge is at risk if there are no measures implemented that are intended to retain critical knowledge (Durst & Wilhelm, 2012). Knowledge loss can also occur as a result of the dissolution of well-established teams.

Additionally, the outsourcing of business functions can increase the danger of knowledge loss, as it may result in the company losing its capability to run those business functions itself. The outcome of this knowledge loss may cause a loss of competitiveness and ultimately the collapse of the company (Brito, de Oliveira, & de Castro, 2012).

On the other hand, knowledge waste can be understood as not using existing knowledge or not supporting the use of the full knowledge capacity. It is defined as any failure in the process of knowledge conversion, better known as the spiral of knowledge creation as proposed by Nonaka and Takeuchi (1997). According to Ferenhof (2011), knowledge waste can take different forms, which are reinvention, lack of system discipline, underutilized people, scatter, hand-off, and wishful thinking.

METHOD

The survey was used as research strategy, since, according to Fink (2013), it is recommended for researchers interested in harvesting information about individuals' beliefs, ideas, plans, and feelings. In the present work, we tried to validate whether the concepts raised by the literature are valid to define waste and loss of consciousness. This happened by including the perception of KM experts.

As data collection instrument, an online self-administered questionnaire was utilized. It consisted of a combination of open-ended and closed-ended questions in order to get the perception of the respondents regarding the definitions of knowledge loss, knowledge waste and its dimensions.

Questionnaires are defined by Sampieri, Collado & Lucio (2013) as a set of questions about a particular topic in order to measure, for example, the views, concerns, and perspectives of respondents. Self-administered means that the questionnaire is offered directly to participants, there are no intermediaries and answers are marked by the participants themselves. In turn, open-ended questions provide more extensive information, they do not restrict beforehand the alternatives of answers. They are usually used when one wants to know the opinion of the respondents (Sampieri et al., 2013).

The survey was pre-tested to verify and validate the instrument, this happened with ten

individuals who have an in-depth understanding of KM. The pretest led to improvements regarding the form, semantics and standardization of some terms to ensure international coverage.

The study´s emphasis was on involving KM experts (i.e. academics or professionals with theoretical and / or practical knowledge about the topic under investigation), who were directly asked to participate. In addition, one of the authors of this paper, invited to the survey at two academic events: 7th International PhD consortium of European Chair on Intellectual Capital Management University of Paris-Sud held in Paris (4 to 6 June 2014), and 9th International Forum on Knowledge Asset Dynamics (IFKAD) held in Matera (Italy) (11 to 13 June 2014).

In total, twenty experts answered the invitation to participate. Their areas of expertise are presented in Table 1.

Table 1. **Experts by Area**

Expert Area	Frequency
Knowledge Management	5
Intellectual Capital	3
Production Engineering	7
Knowledge Management & Intellectual Capital	3
Knowledge Management & Project Management	1
Knowledge Management, Production Engineering & Project Management	1
Total	20

Source: Primary data

The data analysis used the content analysis approach. According to Bardin (2011), content analysis refers to a set of analytical techniques (systematic description of procedures and objectives of message content) that allows the inference of knowledge concerning the messages. Also according to Bardin, content analysis is divided into three stages: 1) Pre-analysis; 2) Exploration material or coding; and 3) Treatment of results, inference and interpretation. Those stages were followed to understand the concepts of knowledge waste and knowledge loss.

RESULTS AND DISCUSSION

Following the steps of content analysis as proposed by Bardin (2011), in the pre-analysis stage the establishment of the textual corpus was held.

The coding was based on a priori concepts of knowledge loss and knowledge waste and its dimensions. Each subcategory was associated with a survey question (Table 2).

Table 2. **Categories defined a priori**

Category	Subcategory	Related questions
KW	Definitions	1. What do you associate with the term "Knowledge Waste" (KW)?;
	Importance	2. Do you think KW is important?; 2.1 - Why?
	Relevance	14. Please rank the six dimensions in terms of its relevance (1 least relevant, 6 most relevant)
	Other Dimensions	15. Can you think of other dimensions that should be included in the concept of KW?
	Dimension Reinvention	8.1 Do you think that this definition fits the concept of KW?; 8.2 In your opinion, how important is this dimension?
	Dimension lack of system discipline	9.1 Do you think that this definition fits the concept of KW?; 9.2 In your opinion, how important is this dimension?
	Dimension underutilized people	10.1 Do you think that this definition fits the concept of KW?; 10.2 In your opinion, how important is this dimension?

Dimension scatter	11.1 Do you think that this definition fits the concept of KW?; 11.2 In your opinion, how important is this dimension?	
Dimension handoff	12.1 Do you think that this definition fits the concept of KW? ; 12.2 In your opinion, how important is this dimension?	
Dimension wishful thinking	13.1 Do you think that this definition fits the concept of KW?; 13.2 In your opinion, how important is this dimension?	
Tools	6.1 - Can you recommend instruments/tools/measures/ techniques to address KW?	

KL	Definition	3. What do you associate with the term "Knowledge Loss" (KL)?
	Importance	4 - Do you think KL is important?; 4.1 - Why? ; 16. In your opinion, is it important to manage KL?
	Instruments	6.2 - Can you recommend instruments/tools/measures/ techniques to address KL?

KW e KL	Differences	5 - In your opinion, is there a difference between Knowledge Waste and Knowledge Loss?; 5.1 - Please, explain your opinion
	Concordance	7 - Do you agree with these definitions?
	Change of Perception	17 - Did you change your perception of KW and KL having been presented the definitions specified in this survey?; 17.1 - If yes, explain your new perception

Source: Primary data

In the followings the results are presented.

1 - What do you associate with the term "Knowledge Waste" (KW)?

The purpose of this question was to capture the understanding, definition, of the respondents regarding the term (Table 3).

Table 3. **Knowledge Waste definition, Prior understanding**

Record Unit	Context Unit	Frequency
Knowledge not used	R1 - knowledge unused	9
	R3 - knowledge isn't applied	
	R4 - knowledge not used for some reason	
	R9 - knowledge not used	
	R12 - valuable information and experience not utilized in the right way	
	R13 - when an employee or person does not participate in idea exchange	
	R14 - knowledge without understanding and deep application	
	R16 - knowledge which is in the organization but nobody used it	
	R20 - knowledge not used in business	
Knowledge Lost	R2 - misuse of knowledge, loss of knowledge	4
	R5 - it means that the knowledge generated is lost, not used and not associated	
	R10 - lost insights and knowing	
	R15 - knowledge is wasted before it wasn't shared before experts leave the organization	
Knowledge Wasted	R8 - "Knowledge waste" is related to waste, not only of tacit knowledge, but the explicit knowledge.	3
	R17 - A kind of knowledge that you don´t need	
	R18 - Waste of time and other resources "Muda"	

Missing Knowledge Management	R6 - Wishful thinking, Handover	2
	R7 - It concerns the lack or poor knowledge management in the organizational context	
Missing Share	R11 - failure to use the shared knowledge and capabilities of an organization	2
	R15 - knowledge is wasted before it wasn't shared before experts leave the organization	
Overload	R19 - Information overload, too much Data production…	1

Source: Primary data

It is noted that nine experts pointed out that the concept of knowledge of waste is related to the record unit knowledge not used. None of the participants mentioned the missing use of knowledge as its full capacity (Bauch, 2004; Ferenhof, 2011; Locher, 2008; Ward, 2007). This may indicate a narrow understanding of the concept of KW or that knowledge waste is not associated with this aspect.

Four participants seemed to equate KW with KL: the knowledge generated and lost, not associated (R5); the misuse of knowledge losing it (R2), the loss and insights (R10); and knowledge lost when people leave the company (R15). These aspects are related to KL as discussed by DeLong (2004), Tsui; Iske; Boersma (2005), Aiman-Smith et al. (2006), McQuade et al. (2007), Durst and Wilhelm (2012), Durst and Ferenhof (2014), thus indicating that there is a lack of clarity about the terms. This lack of clarity among experts might be explained by the complementary nature of the concepts of knowledge loss and knowledge waste.

Three experts addressed the definition of KW as wasted knowledge. R8 did not define KW itself, only emphasized that it is about wasting tacit and explicit knowledge. R17 in turn, defined as knowledge that is not needed and is in line with the thinking of Ward (2007). R18 associated the definition of KW to concepts related to the concept of lean (lean production), indicating the classic waste of production, defined by Taiichi (1988) and reinforced by Womack e Jones (2004). The previous vision of KW definition of these three experts has a weak relationship with the definition suggested by the literature (Bauch, 2004; Ferenhof, 2011; Locher, 2008; Ward, 2007) indicating that they have a notion of what is KW. Two experts relate the concept of a lack of knowledge management. R6 specialist relates to problems of delivery and focuses on one of the KW dimensions, wishful thinking (Ferenhof, 2011; Ward, 2007). In turn, R7 points out that KW is related to poor knowledge management in the organizational context, in line with the precepts statement by Ferenhof (2011). These experts point out problems related to knowledge waste and not to its definition, but one can see the concern of them to point out knowledge management as a solution to KW.

Two participants mentioned the lack of sharing with the concept of KW. R11 stated that the knowledge waste occurs when there is failure in the knowledge sharing and skills in the organization. In turn, R15 pointed out that knowledge must be shared before the departure of a person in the organization. The positioning of these two experts makes reference to the lack of system discipline aligned as stressed by Bauch (2004) and Ferenhof (2011).

R19 associated information overload and the production of too much data (overload) with the concept of KW. This relationship appears to be in line with what Ward (2007) labels as scatter.

Once captured the perception of experts regarding the term waste of knowledge, we started to analyze if it is important in their view.

2 - Do you think KW is important? Why or why not?

The purpose of these questions was to capture the perception of the interviewed on whether the concept is important or not, and finding out the reasons why the respondent supports this view. As answer options yes, no and I do not know were provided (Table 4).

Table 4. **KW Importance**

Do you think KW is important?	Frequency	Percentage
No	1	5
Yes	19	95
I don't know	0	0

Source: Primary data

As shown, nineteen of the twenty experts responded that KW is important. This fact underlines the importance of the study subject. Additionally, we sought to understand why KW is viewed as important (Table 5).

Table 5. Understanding the importance of KW

Record Unit	Context Unit	Frequency
Knowledge need to me managed	R1 - because this knowledge should be managed. Surely there are good practices and lessons learned to share. Failure to use this knowledge at least promotes unnecessary rework.	11
	R3 - I think that KW should be minimized, once knowledge is one of the main resources in actual competitive environment.	
	R5 - The practice of recording lessons learned and having a project library helps to "not reinvent the wheel", to form a base of information on companies and also to close the PDCA cycle, considering that this would be a feedback. Many use the knowledge tacitly, but the challenge is to capture it and add value, turning it into explicit. The greatest asset of an organization is in People considering that the process and tools are easier to replicate. Knowledge management is also important to strengthen the critical mass.	
	R7 - In the new economy the valuation of the company is based on knowledge assets. Thus, if the company does not have the perception of the importance of knowledge management(undertakes his stay) in the market. Studies have shown that companies that manage the intellectual capital better applying knowledge in business processes, gain competitive advantage over the others.	
	R8 - Precisely because knowledge management should seek the lean, ie: focus, structure and continuous improvement "in a spiral".	
	R9 - knowledge if not used on the job is wasted	
	R15 - For many reasons, for example, KM allows the organization to have organized processes in order to capture people's knowledge and transform it to organizational knowledge.	
	R16 - Organization need to create the same knowledge over and over again instead of using one that already exist.	
	R17 - We should be able to choose only the information (or explicit knowledge) that we need to make decisions	
	R19 - If you're not aware of knowledge waste, you find no concepts, to mark use out of the waste or to find / define knowledge ecosystem cycles	
	R20 - because you can prevent high amount of non-used resources	
Impact on production and competitiveness	R2 - is THE critical resource for the competitive and productivity for organizations and it's misuse can impact on the prod. and competitively	9
	R4 - It means that you could be in a better place if you used it.	
	R6 - Discarded knowledge, useless information and waiting are things that we can do better. In this way, it is important to waste knowledge.	
	R7 - In the new economy the valuation of the company is based on knowledge assets. Thus, if the company does not have the perception of the importance of knowledge management, undertakes his stay in the market. Studies have shown that companies that manage the intellectual capital better applying knowledge in business processes, gain competitive advantage over the others.	
	R10 - Opportunity cost	
	R12 - Helps to enhance performance and behavior saving time	
	R13 - KW hurts a company you need to be ahead of the competition if you lag behind you will fail	
	R14 - KW is important because it speaks of unrealized potential	
	R18 - It is a consumption of resources without any added value or benefit	

| Innovation limiter | R11 - it's a big limiter of innovation. | 1 |

Source: Primary data

According to eleven experts, the importance of KW is related to its management. It should avoid rework (R1), minimize its impacts (R3), and avoid reinvention (R5 and R16). When knowledge is not used, it is wasted (R9), it should be sought and lean (R8), it prevents the accumulation of unused resources (R20), it is important to knowledge management (R7), helps in decision making (R17), organizing processes and capture knowledge, transforming them into organizational knowledge (R15), and in identifying and managing waste (R19).

Another view is directly linked to KW's impact on production and competitiveness of organizations. Nine experts mentioned this notion. R7 also highlighted the need to make the management of intellectual capital, and KM, for companies to remain competitive. R2 and R6 showed that knowledge is a critical resource and its misuse impacts production and competitiveness. R4 reinforced the need for management as to manage KW the company can achieve a better position. Such management would help to improve performance and time (R12) and would avoid the consumption of resources that do not add value or benefits (R18). KW checks unused potentials (R14). KW harms the company and thus the conditions needed to be ahead of competition (R13). One has to understand the opportunity cost related to KW Management (R10). Finally, R11 maintained that KW is important because it limits innovation.

3 - What do you associate with the term "Knowledge Loss" (KL)?

The purpose of this question was to capture the previous understanding, the definition that respondents have about what is loss of knowledge (Table 6).

Table 6. **Prior understanding of the concept of knowledge loss**

Record Unit	Context Unit	Frequency
Knowledge that leaves the company	R3 - I associate KL with a person who leaves such an organization. Knowledge was there and used, but who owns the knowledge leaves.	10
	R7 – With regard the escape of company's talent	
	R11 – loss of knowledge through change in personnel or destruction of knowledge sources	
	R13 – when a valuable employee is either retired, terminated or goes to a competitor	
	R15 - It is maybe associated with general employees - turn over.	
	R16 - Knowledge which used to be in the organization but leaves to organization with the resigned / retired employees.	
	R17 - people leaving an organization	
	R18 - Knowledge forgotten at the individual and organizational level. Knowledge lost with retired employees. Knowledge lost with people that just leave the company	
	R19 - to lose knowledge and skills -- personal, societal and historical	
	R20 - knowledge which is lost through retired or leaving employees	
Knowledge disappears	R2 - when knowledge is lost (disappears)	3
	R6 - evaporation of knowledge	
	R8 - I believe the loss is more associated with a result, something already owned and which ends up being lost	
Not proper use of resources	R12 - The phenomenon of not utilizing the right resources and their value to your benefit	2
	R14 - Wastefulness of resources	
Unused knowledge	R4 - It is when you have used this knowledge in a moment and or for some reason you are not using it anymore	1

Knowledge wasted	R1 - They are wasted knowledge	1
Acho que o sujeito	R5 - Knowledge of waste associated with Lean, 8 waste not consider the human talent!	1
Lack of retention	R9 - lack of retention	1
Disease	R10 - Perhaps Alzheimer	1

Source: Primary data

Ten experts linked the knowledge loss (KL) to the knowledge that leaves the company, in line with the concept of McQuade (2007). This is due to a number of factors: personal change or destruction of knowledge resources (R11); retirement, employment by a competitor (R13, R16, R18, R20), death (R13); turnover (R15); loss of knowledge, social and historical ability (R19).

Three experts related the knowledge that KL adds: knowledge disappearing (R2); Evaporation knowledge (R6), and something that we had but got lost (R8). These topics are related to KL concepts presented by McQuade (2007) and DeLong (2004).

Two experts pointed out that KL is not related to the correct use of resources. In the view of R12, knowledge loss is directly linked to the phenomenon of not using the right resources to get the best benefits. R14 in turn, only pointing out that KL is related to resource wasted. These visions are aligned with KW setting indicated by Locher (2008), that knowledge is wasted when not using the skills and expertise of resources altogether and not to KL precepts of knowledge leaving the company (McQuade et al., 2007).

R4 combined KL with the knowledge unused and R1 to knowledge wasted. Both associations are identified in the literature as belonging to KW (Bauch, 2004; Ferenhof, 2011; Locher, 2008; Ward, 2007) rather than KL (DeLong, 2004; Durst & Wilhelm, 2012; McQuade et al., 2007).

R9 brought up the lack of knowledge retention, which is one of the knowledge loss problems, the absence of a company employee by whatever reason, and the company is not more able to access it. This statement of R9 is aligned with the concepts presented by Aiman-Smith et al. (2006), Durst and Wilhelm (2012), Durst and Ferenhof (2014), and Tsui, Iske & Boersma (2005).

R10 associated KL with the Alzheimer disease, pointing his vision on the individual and not in a business context, that fact underscores the importance of putting in evidence the context in which the study is intended.

4 - Do you think KL is important? Why or why not?

The purpose of these questions was to capture the perception of the interviewed on whether the concept is important or not, and verifying the reasons why the respondent supports this view. As answers, options yes, no and I do not know were possible (Table 7).

Table 7. **KL importance**

Do you think KL is important?	Frequency	Percentage
No	0	0
Yes	20	100
I don't know	0	0

Source: Primary data

As can be seen, all the experts responded that KL is important. This fact stresses the importance of managing knowledge loss. Again it was also sought to understand why KL is important in view of the experts' (Table 8).

Table 8. **Understanding the importance of KL**

Record Unit	Context Unit	Frequency
Need to be managed	R5 - For the same reason explained above in KW	12
	R7 - With the economy focused on intangible assets, the company that has no mechanism for capturing and managing organizational knowledge and tacit knowledge. The company loses market value and consequently loses competitive advantage over others.	
	R8 - It is important in terms of identifying which organizational problems are leading to losses, but more importantly, focus on waste that would be the origin of the losses.	
	R9 - knowledge lost is a waste of resources and effort to gain	
	R10 - Hard to regain	
	R11 - it diminishes the potential of an organization to grow and innovate	
	R15 - Because we should still look at ways that would maintain the intellectual capital in the organization.	
	R16 - When employees resigned or retired and the organization never collected their knowledge, the knowledge will be gone with the employees.	
	R17 - Because when someone leaves an organization he/she goes with her/his knowledge and the organization loses knowledge	
	R18 - It could be irreplaceable. It is valuable	
	R19 - knowledge and knowledge work has to be trained, with digital revolution maybe losing knowledge is no longer the problem, but saving the meaning, purpose and use of different (personal, societal, or historic) knowledge	
	R20 - great amount of knowledge is already out there! not need to be reproduced	
Loss of resources	R2 - Because there are opportunities and knowledge which are lost, therefore the organizations lose these resource	9
	R3 - Considering that in my view I associate it with people (human resource), I think that nowadays the main problem that organizations face is to keep people and its knowledge.(Even if you waste knowledge; it can be used when you want). But, when the employee leaves, another needs to be prepared, from the beginning.	
	R4 - It means that something was left behind in the process	
	R12 - You may become not competitive enough if you do not use all the resources available	
	R13 - it can have great implications to your company, sometimes a person who works at a company for years	
	R16 - When employees resigned or retired and the organization never collected their knowledge, the knowledge will be gone with the employees.	
	R17 - Because when someone leaves an organization he/she goes with her/his knowledge and the organization lost knowledge	
	R18 -It could be irreplaceable. It is valuable	
	R19 - knowledge and knowledge work has to be trained, with digital revolution maybe losing knowledge is no longer the problem, but saving the meaning, purpose and use of different (personal, societal, or historic) knowledge	
Unlearning	R6 - It is important to unlearn and abandon practices or even whole strategies that were dominant but are no longer useful.	2
	R14 - "Knowledge Loss" is a tragedy. Some knowledge should be lost because it is of no benefit to anyone.	

Impact on production and competitiveness	R7 – With the economy focused on intangible assets, the company that has no mechanism for capturing and managing organizational knowledge and tacit knowledge. The company loses market value and consequently loses competitive advantage over others.	3
	R11 - it diminishes the potential of an organization to grow and innovate	
	R12 - You may become not competitive enough if do not use all the resources available	
Failure of the use of knowledge	R1 - there are certainly good practice and lessons learned to share. Failure to use this knowledge at least promotes unnecessary rework	1

Source: Primary data

According to twelve specialists, the importance of KL is connected to the need of managing these losses, being related to: ways to retain intellectual capital (R15); to prevent the loss of resources and efforts (R9); to avoid reinvention (R5 & R20); to identify organizational problems which point at sources of loss (R8); to retain knowledge before employees leave the company (R16 & R17); to retain means (R19); difficulty in recovery when it is an actual loss (R10); a loss cannot be fixed (R18); capturing and managing organizational knowledge (R7), and a decreased potential for innovation and organizational growth (R11).

Nine experts indicated that the importance has to do with the loss of resources.

Two experts related KL to unlearning, arguing that it is important to unlearn what is no longer useful (R6 & R14), pointing to the difference between what companies want to forget (unlearning) and what they do not want to lose (KL).

Three experts pointed out the importance of KL with regard to production and competitiveness. R11 mentioned a decreased potential for innovation and company growth. This expert also stated the same on KW. R7, additionally, stated that it needs to be managed; he specified that when KL is not managed as a consequence the company will be less competitive, a view that was shared by R12, even though he associated the loss of competitiveness with the loss of resources.

Another expert stressed the importance of KL in order to revolve around the failure of knowledge use, rework should be avoided (R1).

5 - In your opinion, is there a difference between Knowledge Waste and Knowledge Loss?

The purpose of these questions was to understand if there is a difference between the concepts of KW and KL in the perception of respondents (Table 9).

Table 9. **Prior opinion if exist difference between KW and KL**

In your opinion, is there a difference between Knowledge Waste and Knowledge Loss?	Frequency	Percentage
No	1	5
Yes	19	95

Source: Primary data

The data indicate that nineteen participants see differences between waste and loss. Next, we tried to understand the main differences between the terms (Table 10).

Table 10. **Prior understanding of the difference between KW and KL**

Record Unit	Context Unit	Frequency
KW: Knowledge exist, but not used KL: Knowledge is gone	R2 - one we don't use and the other we lose	14
	R3 - KW: Knowledge present but no used. The organization keeps access. KL: Knowledge that organization loses access to. Can happen when an employ leaves the company.	
	R4 - The KL means that you have already used it, so clearly you know that it is useful and you know how to use it and the value of it. The KW means that there is an "opportunity cost" of not using it.	
	R7 - In both situations the company loses. In my opinion, waste concerns the knowledge available within the company BUT not used in business processes. On the other hand, the loss is the lack of company management not to provide ways and mechanisms for outsourcing and knowledge retention.	
	R9 - knowledge waste is knowledge not used, but could be; KL can never be used after the loss	
	R11 - loss is gone forever. waste is misuse of something you have.	
	R12 - I understand that waste is that you have it but are not using it, but you can readjust anytime, while the loss is that you do not have it anymore	
	R13 - KW is just not caring or wrong person for the job, KL is maybe years of training and insight that is lost when someone is not there anymore	
	R14 - KW is to consume, spend or squander useful knowledge ... to waste the opportunity to maximize the good we can derive from the knowledge. To waste is to treat it with disregard. Bureaucracy, hierarchical lineages in company, lack of excellent ways to capture knowledge and share it ... all result in Knowledge Waste. KW results in less profitability and impact for good. Wasted dollars, wasted energy, wasted people, wasted time, etc. are all a part of KW. KL is not protecting and deriving ways to capture knowledge and share it. KL is to fail to keep, have or get knowledge. This is why Knowledge Innovation is so important.	
	R16 - Knowledge waste is knowledge that has never been used but still exists in the organization. Knowledge loss is knowledge that leaves the organization with ex-employees.	
	R17 - An organization can Lost knowledge (when someone quits) but there is no waste of knowledge. Knowledge is always useful...	
	R18 - Knowledge waste exists in organization but it is not used, or not used properly Knowledge waste is gone from the company. It does not exist anymore KL is the loss of meaning of knowledge	
	R19 - KW is the overproduction of non-self-understandable knowledge	
	R20 - not used knowledge in comparison to knowledge which is needed, but lost through departure	
Disjointed explanation	R1 - I think the difference is the temporal dimension and perception of the creator's own knowledge.	5
	R6 - Losing useless information is different from unlearn or abandon useless information. In the first case is a result and in the second is the action.	
	R8 - I have explained previously. Perhaps this question becomes repetitive, for when the respondent is aware, probably have already addressed this gap in the previous questions.	
	R10 - Waste is still not a loss	
	R15 - I explained it previously.	

There is no difference	R5 - Depending on the author, change up the terminology, but the meaning is the same. Earlier writers such as Shingo and Ohno spoke about losses, Womack, Jones; Bauch among others use the Waste term. Waste is used incorrectly and that the loss is the result of waste.	1

Source: Primary data

The differences seem to mainly revolve around: KW: extant knowledge that is not used and KL: Knowledge that does not exist anymore in the organization.

One expert saw no differences (R5), he mentioned the concept of lean thinking and abided to the terminology, indicating that the meaning of the terms is the same. However, R5 contradicted himself by stating that the loss is a consequence of waste.

6.1 - Can you recommend instruments/tools/measures/techniques to address KW?

By asking this question it was aimed to know the perception of experts regarding the existence of instruments / tools / techniques for managing the knowledge waste (Table 11).

Table 11. **Recommended tools by the specialists to manage KW**

Record Unit	Context Unit	Frequency
Do not know / No mention	R4 – No	8
	R6 – did not mention anything.	
	R7 - It is difficult to give an opinion without knowing in greater depth the theme but the waste of matter itself	
	R14 - did not mention anything.	
	R15 – No	
	R16 – No	
	R17 - did not mention anything.	
	R20 – No.	
KM Techniques	R2 - GED, ontologies, lessons learned	6
	R5 - Design Library Lessons Learned record Process standardization Checklists determined gates Management Information Systems in support Closing meetings -- feedback to assess successes and failures Techniques for Problem Solving, Kaizen. Indicators such as measuring the quality of information, such as how many items had to be reworked, how much time was spent in search of information, as it saved time taking advantage of a solution ...	
	R8 - I believe that the classical tools used in knowledge management can be used in the identification and treatment of KW and KL: -- Brainstorming, panel of experts, relationship networks, social networks, Benchmarking, SWOT, Delphi, Scenarios, among other techniques.	
	R12 - Surveys, focus groups, participation, research on knowledge hidden in your team.	
	R13 - Meetings and internal surveys to weed out incompetence	
	R18 - Mapping the organizational knowledge increasing knowledge sharing Making managers aware of the value of existing knowledge Creating a culture that encourages everybody to think and create knowledge Create leadership able to appreciate knowledge as a resource and the fact that every employee can think and create valuable knowledge A lot of knowledge is wasted when managers consider that THEY are the only capable people of thinking and making decisions	

	R9 - Metrics that Matter is a survey tool that uses the 4 Levels of Kirkpatrick that can measure KW and KL	
	R10 - Google	
Specific Tool	R11 - This is a strategic challenge. I recommend maintaining a high level inventory of all knowledge (defined as intangible capital) using something such as the ICounts Canvas. This inventory can be used to create a measurement system.	4
	R19 - GB of server (clouds) over the last 10 years, Servers of Universities, ...	
K-Maps	R1 - I work with concept maps which we called dynamic knowledge maps the project team should keep an updated map of knowledge created during the project where categorize the data, information and knowledge relating them to the authoring process. We highlight the potential knowledge. Sheets where you explore these relationships and constructive processes are also created. thus facilitates the use of knowledge by other project teams any time.	3
	R3 - I don't have something specific, but it's possible: - Map employs competences, abilities and attitudes and compares it with what the company uses; - Based on organizations strategy and defined actions, and measures those aspects of goals not reached. And then, map the knowledge inside the company that could be used and where not.	
	R18 - Mapping the organizational knowledge increasing knowledge sharing Making managers aware of the value of existing knowledge Creating a culture that encourages everybody to think and create knowledge Create leadership able to appreciate knowledge as a resource and the fact that every employee can think and create valuable knowledge A lot of knowledge is wasted when managers consider that THEY are the only capable people of thinking and making decisions	

Source: Primary data

Six experts listed various tools and classical techniques of knowledge management to make the management aware of waste, but no template or tool that specifically deals with waste was appointed. This could indicate the absences of this kind of tool.

Four experts referred to marketing tools to handle KW, such as a survey called "the metric that matters" (R9), Google (R10), ICounts Canvas to create an inventory of knowledge (R11), and server data GigaBit at universities (R19). Such tools will be useless without a proper understanding of what KW is, what its dimensions are and what could be proper metrics to measure them.

Three participants (R1, R3 and R18) indicated knowledge mapping as a way of dealing with KW. The K-map can be of great value to help identify knowledge, which may be otherwise wasted or lost.

The remaining experts did not know or had no opinion about it.

6.2 - Can you recommend instruments/tools/measures/techniques to address KL?

We asked the same question also for KL (Table 12).

Table 12. **Recommended tools by the specialists to manage KL**

Record Unit	Context Unit	Frequency
Do not know / No mention	R2 – maybe give me alternatives or a list of them	6
	R4 – No	
	R6 - He did not mention anything.	
	R11 - no specific tools	
	R16 - No	
	R19 - No	
KM Techniques	R3 - Turnover index, but focused on the knowledge.	8
	R7 - In the issue of loss of consciousness, the process of knowledge management, in my opinion, is more complex. Whereas the loss most often is related to the tacit knowledge and mostly inaccessible by the company. So in my opinion, the instruments for retention of that knowledge go through the management of human capital and, if so, I would recommend the tools used to manage people in order to seek the retention of brains in the business.	
	R8 - I believe that the classical tools used in knowledge management can be used in the identification and treatment of KW and KL: -- Brainstorming, panel of experts, relationship networks, social networks, Benchmarking, SWOT, Delphi, Scenarios, among other techniques.	
	R12 - Exit interviews, mentor programs, storytelling and retention	
	R13 - share knowledge and recording it for future use	
	R15 - You can look at the study by Peter Massingham entitled Measuring the Impact of Knowledge Loss: More Than Ripples on a Pond? (2008)	
	R17 - Identify the people that have strategical knowledge and essay to keep them	
	R18 - Stimulate intergenerational learning stimulate mentoring Stimulate coaching Stimulate mix-aged teams and intergenerational learning Stimulate knowledge capturing and creating databases Stimulating videotaping interviews and conferences with experts before they retire create a culture of respect for other people experience and knowledge	
	R9 - Metrics that Matter is a survey tool that uses the 4 Levels of Kirkpatrick that can measure KW and KL	
	R10 - Opportunity cost accounting	
Specific Tool	R14 - There is a new technology called Flatworld. The URL is http://www.flatworld.co Kim Chandler McDonald and Michael McDonald are the founders. They created Flatworld for knowledge capture and sharing. It's intuitive, simple and FABULOUS. I heartily recommend you look into it!	2
	R19 - GB of server (clouds) over the last 10 years, Servers of Universities, …	
K-Maps	R1 - I work with concept maps which we called dynamic knowledge maps the project team should keep an updated map of knowledge created during the project where categorize the data, information and knowledge relating them to the authoring process. We highlight the potential knowledge. Sheets where you explore these relationships and constructive processes are also created. Thus facilitates the use of knowledge by other project teams any time.	2
	R20 - knowledge map of companies	

Source: Primary data

R1 and R20 showed the use of knowledge mapping as a way of dealing with loss of knowledge. As the loss of knowledge are directly linked to turnover (Durst & Wilhelm, 2011) knowledge mapping

can act proactively. Further the application of KM techniques were recommended by the experts (R3, R7, R8, R12, R13, R15, R17 & R18) such as job rotation, shadowing, mentoring or other restraint techniques and knowledge sharing to eliminate and / or mitigate losses.

R9 and R19 reaffirmed the use of the same tools aimed at KW in the previous question. R14 indicated a capture tool and knowledge sharing, which promise to mitigate loss of knowledge, and R10 suggested checking the opportunity cost. The other experts were unable or chose not to respond on the matter.

7 - Do you agree with these definitions provided?

The participants were also provided with the definitions of waste knowledge and loss. The intention was to make an external validation of the concepts. As response options the respondents could choose between: I agree with the two definitions, I agree only with the definition of KW, I agree with only the definition of KL or disagree with both, as shown in Table 12.

Table 12. **Opinion a posteriori concepts of KW and KL**

Answer	Frequency	Percentage
Agree with both definitions	15	75.0
Agree only with KW definition	1	5.0
Agree only with KL definition	3	15.0
Disagree with both definitions	1	5.0

Source: Primary data

As can be seen, fifty experts agreed with both definitions. Only one expert disagreed with them. This finding suggests a good match between theory and expert knowledge.

The questions 8.1, 9.1, 10.1, 11.1, 12.1 and 13.1 intended to verify that the concepts presented for each of the KW dimensions are adhering to the overall KW concept. Experts could choose from a range of one to seven (1- Not all and 7 Very well). The descriptive are presented in Table 13.

Table 13. **Expert opinion on the concepts presented in KW dimensions**

Question	Do you think that definition fits the concept of	Minimum	Maximum	Mean
8.1	Reinvention	1.00	7.00	5.7500
9.1	Lack of System Discipline	1.00	7.00	5.6500
10.1	Underutilized People	3.00	7.00	6.2000
11.1	Scatter	3.00	7.00	6.1000
12.1	Hand-Off	2.00	7.00	5.5500
13.1	Wishful Thinking	3.00	7.00	5.7500

Source: Primary data

According to the data, the average mean of all six dimensions is greater than 5.5. Thus, they all fit to the KW concept.

The following questions 8.2, 9.2, 10.2, 11.2, 12.2 and 13.2 were intended to verify the importance of each of the dimensions of knowledge waste. Again a Likert scale ranging from one to seven (1- Not important at all, 7. Very important) was used (Table 14).

Table 14. **Importance of KW dimensions**

Question	In your opinion, how important is dimension?	Minimum	Maximum	Mean
8.2	Reinvention	1.00	7.00	5.9000
9.2	Lack of System Discipline	1.00	7.00	5.8500
10.2	Underutilized People	3.00	7.00	6.4500
11.2	Scatter	3.00	7.00	6.1500
12.2	Hand-Off	3.00	7.00	5.7000
13.2	Wishful Thinking	3.00	7.00	5.5500

Source: Primary data

By analyzing the means, it can be concluded that the order of importance indicated by the expert is as follows:
1. *Underutilized People*
2. *Scatter*
3. *Reinvention*
4. *Lack of System Discipline*
5. *Hand-Off*
6. *Wishful Thinking*

14 - Please rank the six dimensions in terms of its relevance (1 least relevant, 6 most relevant).

Question 14, was intended to sorting by relevance (everything that deserves attention). The experts were asked to rank the six dimensions from one (1) less relevant to six (6) more relevant.

Table 15. **Order of relevance of the dimensions of KW**

Analyzed Dimension	Minimum	Maximum	Mean
Reinvention	1.00	6.00	4.6000
Lack of System Discipline	1.00	6.00	3.9500
Underutilized People	2.00	6.00	4.8000
Scatter	2.00	6.00	4.1000
Hand-Off	1.00	6.00	3.6500
Wishful Thinking	1.00	6.00	3.3500

Source: Primary data

By analyzing the average, it can be concluded that the experts emphasize the order of importance as follows:
1. *Underutilized People*
2. *Reinvention*
3. *Scatter*
4. *Lack of System Discipline*
5. *Hand-Off*
6. *Wishful Thinking*

Comparing and analyzing the order of importance and relevance, it is clear that Reinvention and Scatter change places.

Table 16. **KW Dimension: Importance vs. Relevance**

Order	Importance	Relevance
1	Underutilized People	Underutilized People
2	Scatter	Reinvention
3	Reinvention	Scatter
4	Lack of System Discipline	Lack of System Discipline
5	Hand-Off	Hand-Off
6	Wishful Thinking	Wishful Thinking

Source: Primary data

This suggests the specialists give more credit to scatter instead of reinvention. And the reinvention that needs to be managed more carefully.

15 - Can you think of other dimensions that should be included in the concept of KW?

The participants were also asked to name additional dimensions to operationalize KW, however, none of the experts answered this question.

16 - In your opinion is it important to manage KL?

The purpose of this question was to capture if managing KL is important or not. A Likert scale ranging from 1- Not important at all to 7 - Very important was provided (Table 17).

Table 17. **Degree of importance of managing KL**

Question	Minimum	Maximum	Mean
In your opinion is the important to manage KL?	4	7	6.5

Source: Primary data

The mean of 6.5 suggests that the management of KL is considered as highly important.

17 - Did you change your perception of KW and KL having presented with the definitions specified in this survey? If yes, explain your new perception.

Question number 17 aimed at verifying if the experts have changed their perception about the concepts of KW and KL in the course of the survey. The findings are presented in Table 18.

Table 18. **Change awareness on setting KW and KL**

Did you change your perception of KW and KL?	Frequency	Percentage
No	11	55
Yes	9	45

Source: Primary data

With sub question 17.1 we sought to understand what changed after the presentation of the concepts to experts.
When faced with the concepts presented in the survey, nine of twenty experts stated that they had changed their perception of the concepts of KW and KL.
In Table 19 it can be seen that eight of these experts who changed their minds, developed a broader view of the concepts (one did not mention the reason for the change in perception).

Table 19. Exposure of opinion change reasons as to the concepts presented

Record Unit	Context Unit	Frequency
Broadened the vision	R1 – increased the dimensions of analysis	8
	R3 - Perhaps it's not a change, but before my view was more "simplistic".	
	R8 - This semantic distinction is not very clear. So common sense we use these two terms interchangeably ... "I missed that opportunity" or "I wasted this opportunity." However, if we look kaizen, this philosophy there are such differences, on the shop floor and in manufacturing it becomes clearer. Undoubtedly, the challenge is to make this distinction in services, the variability of characteristics, intangibility, simultaneity and heterogeneity they have.	
	R9 - broaden my perception and helped to think about it differently, would be interested in the results!	
	R11 - You made me think about it but you forced the conversation around your definitions. I think the perspective is too abstract, focused on theory of KM rather than linked to corporate actions and objectives.	
	R12 - more formal and with deeper concepts	
	R15 - generally KW happens when we don't use our full capacity of knowledge and efforts, while KL happens when we don't have the qualified people to make the specific decisions about something.	
	R17 - Both are talking about knowledge for organizations not knowledge in general	
Did not mention	R6 - Did not mention anything	1

Source: Primary data

Once the data analysis and discussion are presented, we proceeded to the final thoughts.

FINAL THOUGHTS

Based on the findings presented above, it became clear that KL and KW need greater attention in research and practice. It was also underlined that KW and KL are different concepts. Additionally, the findings suggest that the six KW dimensions proposed by Ferenhof (2011) are considered as important and relevant.

From a theoretical point of view, this paper provides insights into the differences between knowledge loss and knowledge waste, thus it expands our understanding regarding
terms that more address the risky sides of knowledge.

From an academic perspective, the paper may provide a starting point for new researches that are interested in avoiding (at least reducing) knowledge wastes and losses.

To the best of the authors' knowledge, no analysis on this topic has previously been published or presented.

Given the small sample size, one limitation is that the results cannot be generalized. Another limitation has to do with the target group, i.e. KM experts. In order to develop an in depth understanding of the concepts we also need to involve other group of persons, such as managers, or entrepreneurs to reduce any biases involved.

For future research it is recommended to take advantage of larger samples that follow random sampling so to gain results that are more robust. It would also be promising to search for additional dimensions in order to better discuss the two concepts. Finally, the relationships between the items should be researched.

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